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CRANIO-MUSCULAR ORIGINS OF BRAIN AND MIND

BY

PHILIP H. ERBES

AUTHOR OF

"Co-Origin of Organic and Inorganic Life"

A PAMPHLET

Nihil est in intellectu quod non
primus fuerit in sensu.—*Aristotle*

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To

those professional men and women who, through
a scientific knowledge of themselves, desire
to attain a mastery of and superiority
over life, its work and its art

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*When phrenological terms appear they imply nothing more than that brain experimentation and phrenology are upon common ground.

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PART SECOND.

PREFACE.

Since the days of Ferrier a reference to the brain areas is from year to year assuming increasing space in English physiologies. But to my knowledge no serious attempt has ever been made to show what effect the scheme of cranial and epicranial muscles have had and still have upon the conformation of the skull and, consequently, had in determining the location of these areas and in giving brain and mind a character approximately identical from end to end of the scale of living things possessing the cerebro-spinal nervous system. In so far as the neural matter is dependent upon the cranial muscles—aside from the sensory stimuli—so far, likewise, are the psychic manifestations, through tongue or limb, modified by variations in these muscles that, after their creative task is done, assume a vaso-motor control over their respective areas.

In this work, however, I pretend to no exhaustive treatment of the evolutional origins of brain and mind. The principle set forth is as important and inexhaustible as that of evolution itself is. It enters the pyschical realm and comes into conflict with myth at every turn. Let us hope that we have freed ourselves from that narrow, practically primitive, mental attitude which presumes to explain man as a construction of a few simple wheels, just because of our incapacity for causal grasp we are like our barbarian forebears who were unable to intellectually count above three. Let no one delude himself into believing that we can live life better by guessing at what to do than by knowing what to do. It is only by conforming to reality, visible and invisible, that we can ever hope to place life and conduct upon a sound basis. It is not the facts, but false opinions that injure us. Moreover, in this proceeding we shall also be compelled to show a proper respect and warmth of sympathy for the sensibilities of personality.

Since the principle developed in this work presupposes a considerable knowledge of the structure of the organism commonly overlooked, and since there is a revelation of many facts which necessitate a reconstruction and reinterpretation of some existing psychological conclusions —empirical and scientific—a vast amount of explanatory matter is interspersed through that which simply relates to the unfolding of the leading principle. The chapters on emotion, consciousness, intellect, and that calling attention to the orderly reduplication of the spinal cord in the cerebral hemispheres, because of the original material presented therein, I recommended for special attention; also the observations upon imagination and laughter. The entire book is avowedly committed to carrying the law of evolution to the limit. I could not do otherwise. If the Creator, whatever his nature, did rest upon the seventh day, He returned to the work again upon the eighth— neither the world or Bible is yet finished.

P. H. E

Chicago, July 4, 1904.

PART FIRST.

BOOK I.

FUNDAMENTALS—ORGANIC

CHAPTER I.

HEAD, BRAIN AND MIND.

The general capacity and the character of a vertebrate mind always has been rated, precursively and abidingly, from the movements (expression) of the cranial muscles, in the same manner as certain finer mental movements are determined from the musculature of the face. In this respect brute, woman and man, are judged alike, the conscious acceptance of any contradictory theories notwithstanding, for empiricism is always naively unconscious of its inconsistencies in accepting undigested assertions. But the ability to interpret expression is not inborn, a priori, save perhaps in the slightest degree. It is unconsciously learned from daily experience, from the observation of an organism through which mind is what it is, and is at all; and hence its reliability, its comparative freedom from fantasy. In the relation of man to man, therefore, the uncovered neck and head betoken sincerity, respect, friendship.

When the old Christian authorities compelled our long-haired forebears to cut their locks sufficiently short to expose at least their ears, they took a great step in exposing a musculature that never lies, and in counteracting the advent of the chicanery which tends to go hand in hand with civilization and with the restraint and degeneration of this musculature.

To the child and to the adult, in a larger degree than we have yet come to realize, and because learned from a daily unconscious observation, the muscular states and movements in the neck and head are the surest criterion of what a brute or man really is, and this though the particular thoughts and deeds cannot be predicted from them. Yet even at the inner structures and subtler operations we can make a close guess in the case of a normal being in a known environment. Idiots and abnormal characters, moreover, are ever marked by irregular developments of parts of the head, and consequently also of the structure and mode of attachment of the cranial muscles.

(From the muscles attached to the cranium it is an easy step to the conformation of the cranium itself. What is dynamic in the muscles is static in the form of the skull.) In proportion as the conformation of the latter is hidden by a mass of hair, by so much is a being wrapped in a mystery which acts and words do not entirely dispel; language especially, being second-hand, is more or less symbolical and tentative. Of the skull and brain, the brain is what it is because of the former; and the form of the skull is what it is because of the cranial muscles. This relation came about evolutionally, in obedience to the laws of cause and effect. We cannot say and believe otherwise without involving ourselves in an absurd and incomprehensible antithesis. It is not a case of the mind making the brain and organism, but rather the reverse—it is not a case of the sun revolving around the earth, but the earth revolving around the sun.

A definite colloidal form is necessary for every manifestation of organic energy; organic energy is what it is mostly because of organic forms. Mind is such an energy and its core is the brain. No matter through what system of inter-connections the results come about, the form of the brain plays an obstinate role in determining the nature of the particular and universal mind. To the brain the enveloping cranial shell bears as intimate a relation as does the contractile envelop of the undifferentiated cell, containing a sensitive nucleus, upon which environment plays. That is, molar impressions as well as molecular vibrations set the nervous system into operation. But we are approaching the interdicted field of phrenology dangerously close, though why should a free mind rant because phrenology has gone to ridiculous extremes? Phrenology, resting upon the empirical universal observation to which I have referred—being, perhaps, a little more ridiculous than the old speculative psychology—and cerebral experimentation both have the same physical starting-point in common; both are still far from a thorough grasp of the entire truth. Few men are equal to a Ferrier or a Flechsig in the matter of brain localization; many noted physiologists hardly dare to touch upon the brain at all. In phrenology who has approached Gall, save a few contemporaries and immediate followers? Despite his limitations, the lack of exact knowledge of details, and the conservatism of tradition which partly enthralled Gall, he was intuitively familiar with his subject of interest, through an advanced observation which was both empirical and scientific. He forestalled the later science in locating the cerebral areas, and if the terms employed by him and those used by brain experimenters are compared, as I shall try to do in this work, it will be found that the two have continually indulged in the old quarrel of meanings much of the time.

Gall lived in an age when the spirit of freedom was abroad; in the age of Rousseau, Lamark, Goethe, Darwin, Hoppe, Bell, Delsarte. It often seems that he knew more than he dared to speak and that he died taking with him the secret bases of his conclusions. Mayhap his knowledge fell upon the ears of dark minds and was not understood save by a few. From Spurzheim and others we have it that he followed the active cranial muscles in locating the brain area of an active phase of mind. In modern times Wundt, without perceiving the full extent of their significance, called attention to the muscular tensions appearing upon the brain-pan in our efforts at thought and recollection. In their works on physiognomal expression Darwin and Mantegazza alike despair of falling back upon a sure physical basis from which there is no escape.

Let us then state the proposition I propose to explain and apply to the vertebrates in the course of this volume, and which will clear up the matter. *The cerebral mass owes its location and subsequent expansion, moreover, in a measure mind owes its character, primarily to the action of the muscles attached to and lying upon its peripheral covering, the skull; these same muscles thereafter, through exercising a cerebral vasomotor control, act in the nature of keys for calling the evolved dependent brain areas into play, singly and en masse.* This principle explains why the head is a stable criterion, what though accidental modifications intervene. It is the cranial muscles which made possible the reduplication, as it were, with improvement, of the spinal cord in the head; the reduplication being superimposed upon the anterior end of the original spinal segmentation. For the treatment of the segmentation of the original spinal tract the reader is referred to the

"Physiology of the Brain," by Loeb. The location of the nuclei of the nervous system, the position of the brain and its centers, did not come about by accident, and it is the muscles adjoining them which constituted the most important of the determinant factors, as regards both gray and white layers. It is these muscles which practically gave the nuclei and the cerebral areas an homologous position throughout the vertebrate scale.

It was while studying the work on the Beauty and Defects of the Human Body, by Bruecke, in connection with the Artistic Anatomy of Duval that I suddenly became aware of this remarkable yet natural direct and indirect mechanical effect the cranial muscles, through the integument and plates of the skull, evolutionally exerted and still exert upon the development, activity, repression or expansion of the brain, and of mind correspondingly. If the activity of a section of the brain causes heat sufficient to be detected upon the overlying cranial plate, the heat generated by the active cranial muscles would, conversely, awaken the underlying area, even though their influence extended no further. But observe the outward expansive effect of the masseter at its present state of development—when it is no longer affixed directly to the plate—in action must still produce, through the lever afforded by the zygomatic process, upon the temporal bone and its squamosal part, Fig. 1. Nor does the hinge of the jawbone interfere with this effect that is necessarily slight.

The significance of the law we have stated becomes particularly plain when we stop to think of the membranous and cartilaginous condition of the brain-casing at the beginning and in the early stages of evolution; and of the pliability and mobility of the cranial plates in the foetus, child and youth, though it must be borne in mind that these same structures, when once they have become fixed in place, also exert an unvarying or repressive effect. "An old dog cannot be taught new tricks," is a saying whose meaning is almost literally true, yet, in so far as heredity operates, even a young dog is already partly old.

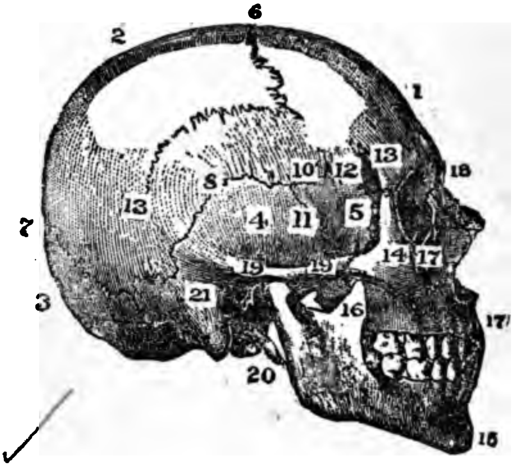

Fig. 1.

THE SKULL.

1, Frontal bone. 2, Parietal. 3, Occipital. 4, Temporal. 5, Great wing of sphenoid. 6, Coronal Suture. 7, Lamboidal S. 8, Squamosal S. 10, 11, 12, Sphenoidal. 13, Line bounding temporal fossa. 14, Malar bone and its processes. 15, Inferior maxillary bone. 16, Coronoid process. 17, Superior maxillary bone. 18, Nasal eminence. 19, Zygomatic arch. 20, Styloid process. 21, Mastoid bone and process.

*Figs. 1 and 3 are adaptations from the "Artistic Anatomy" of Duval—Eng. ed. of Cassell & Co.

Observation of living forms, normal and abnormal; of animal heads in dissection; of skeletons and skulls; especially of those in the Field museum and in the Academy of Sciences of Chicago; and the study of evidence in whatever form accessible in many branches of science; the study *of the works* of Weismann, Munk, Haeckel, Spencer, Romanes, Ferrier, Loeb, Meynert, Gegenbauer, Hertwig, Flechsig, Waitz, Cleland, Luys, James and Münsterberg—lifted an inspiration into a conviction. At the root the matter resolves itself into this: That the anterior portion of the original spinal tract was once encased in a covering similar to that of the spinal column, but possessing peculiar functions of its own. The beginning of its superior sensitiveness, which resulted in the establishment of the sense-organs of the head, appeared at the stage when the primitive creatures was more or less stationary. Its upper part of the body was then continually exposed to the light and other subtle overhead stimuli and became the more sentient and psychological pole of the organism—a fact which would not interfere with the possible existence of a low-placed nervous system principally attracted by nether forces. The head end of the spinal tract was later in its turn lifted above the posterior part and further developed the eyes, ears and other special sense-organs—servants of the brain—the pineal eye being situated at the top of the head, at a time when the creature looked upward, above all out of the water, or when it yet crawled close to the ground. The real evolution of the brain did not begin until the head and superior mind was employed in the getting of food by the improvised jaws and mouth.

Yet, after the establishment of the alimentive cerebral areas over the cavity of the mouth, the cranial advance would not have gone far had it again not been for the movable branchial appendages, especially the first of these which assumed the office of the lower jawbone, used in the prehension of food and its mastication, for self-defense and offense, besides other ends. Before going deeper in our analysis we must remember that the development of the mouth produced a double cavity of the head and that each cavity originally possessed an independent set of muscles, those of the neural tube proper and those of the visceral arches, both sets being innervated by certain of the spinal nerves whose origin lies below the cerebrum. Laterally it is the muscles running from the neural to the upper cavity that concern us most; such are the temporal and the masseter. Other muscles are those of the ear, the mastoidal, the cervical and the epicranial. It was the contraction or relaxation of these muscles, innervated from previously existent nervous tracts, according to the direction of the contracture, that determined the location of an area of reinforcing cortical matter tending to form at moments of effort in special directions, because they created a point of least resistance beneath the cranial covering involved. The same muscular contracture and necessity for cerebral neural reinforcement invariably went together and must have done so from the origin of the evagination constituting the brain. At the same time the effect of the muscles must always be slight enough so as not to inter-

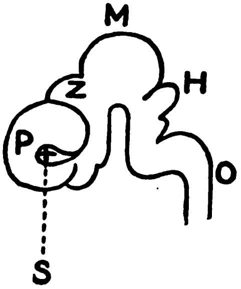

Fig. 2.

THE PRIMITIVE BRAIN. (DIAG.)

P. Prosencephalon (fore-brain). M. Mesenceph. H. Cerebellum. O. Medulla oblongata. S. Point at which fissure of Sylvius formed. Z. Thalamencephalon. (Meynert.)

fere, by causing cerebral congestions, with the association of cerebral energy which underlies mentality.

Since the muscles were in pairs the parts of the brain were doubled, even the dorso-cervical muscles are practically paired and laterally situated. Nor does a single pair of muscles often act alone, but several pairs usually contract or relax—relaxation causing a subsidence of brain activity—co-ordinately, though one or the other takes precedence. The intense activity of the brain as a whole, sets the mind into confusion, or causes idiocy, a fact well illustrated by the overheated head. The brain thus naturally functions by areas (Meynert). The cerebrum and the spinal tract are thus not accidentally a counterpart of the physical organs, and this is true though the inherited areas often expand out of all proportion to the cranial musculature in man. The inter-relation aids to prevent derangements and confusion of physical functions. It established a reliable physiological mechanism, observed in the cruder feature expression particularly, for the control of the cortical areas.

Moreover, the cranial muscles principally played this evolutional part upon the lower half of the brain cavity and brain, when the mental organ possessed little or no self-initiation beyond that furnished by the sensory currents—it still stood near simple reflexiveness. The supersensory associative circuits were still short and few. But as the upper parts of the cerebral cortex became more developed, the interplay of the cerebral currents of themselves were sufficient to favor expansion when a surplus of energy, causing a fission of cells, and the provoking stimulus existed, yet nevertheless under the suggestive control of epicranial muscles. Some expansion may in the advanced stage also be due to the inheritance of cells and structures from a double parentage, the offspring being endowed with two potential cells, for instance, side by side where the parents each possessed but one. The inner play of currents of the higher brain would, likewise, in conjunction with the currents arising from underlying structures with which its areas are connected in the organism, send additional stimuli to the lower areas and so contribute to their growth. And it is perhaps incumbent that at this point we should call attention to the fact that while the gray neural structures undoubtedly differ somewhat in different regions, consequently generating a difference of energy, it is not so much upon that that the difference in areas depends as it is upon the peripheral structure of the body of which the sense-organs are nuclear stations. The ends of the sensory and motory nerves are connected with a definite nucleus of gray, and it is the difference in the mode of response caused by these systems of connection that causes the apparent and so-called difference of function of the cerebral areas; whilst at the same time some diffusion of energy takes place through the existence of associate fibres. The effect of the efferent current is determined by the nature of the bone, muscles and other tissue of the member through which it manifests itself in action.

To my knowledge a dynamic dilative effect of the muscles of the cranium has never been perceived and credited, much less the subsequent vaso-motor control, probably owing to the intricacy of the matter. The relation to the cerebral areas has never been seen. Rather attempts have always been made to show how wonderfully contrived the skull is to resist a single displacement of one of its plates. Brain experimentalists give us their results, but make no attempt at accounting for the approximate homologous location of the particular areas in question, whose place is fixed as invariably as that of any muscular organ, and whenever there is a difference in structure, there is also a difference in mind, brute or human. As far as mental equilibrium is produced, the areas might, hitherto, have been placed otherwise, and yet they never are. Anthropologists only in the most indefinite way account for the breadth of skull in a mountain people; for the narrow head of the Negro; for the broad, practical head of the unwarlike Chinese; for the peculiarly ridged skull of Arctic peoples. All falter at tracing the workings of evolution, the laws of cause and effect, to the limit against the ingrained speculative illusions and delusions of mind. Still Virchow unwittingly admits that the skull does not owe its conformation to the independent growth of the brain; and Owen states that the outer surface of the skull presents a great diversity of character which relates to the development of the temporal and masseter muscles, and to the varieties of dentition in the different genera. It was Westermarck who declared that the practice of deforming the head exaggerates the characteristics peculiar to a people.

Again, I do not wish to be understood as standing in an obtuse opposition to inspirational knowledge. Even reason is largely imaginative. In mind there occur associations of which we gain no conscious knowledge save as to the result, and their correspondence to reality, therefore, depends upon the soundness of a brain and its earnestness of observation. I do not reject the Teachings of Christ, but I do declare that they are not understood or seen in the proper relation to fact and reality, to say nothing of their not being lived up to by their professed votaries, or being embodied in our institutions. In this state of affairs the sooner we arrive at what the facts of reality and self are, the better it will be for mankind. It is the one way to do away with skepticism, supernaturalism, and an unmitigated animalism which disregards the laws of visible nature herself. The true religion will turn out to be nothing more than a comprehensive utilitarian form of materialism in which the supreme moving energy is that which is spoken of as God. In respect to the disobedience of universal nature's laws we must stand abashed before our robust barbarian ancestors, of whom error and the rigors of existence upon the body's plasm destroyed many but sin, few. To their painstaking obedience we owe the magnificent heritage of our organism and mind.

CHAPTER II.

OTHER PHYSIOLOGICAL AND PSYCHOLOGICAL FACTORS.

We shall deal with things tangible for, as Wundt remarks in his psychology, we cannot experiment upon mind itself, but only upon its outworks; upon the organs of sense and movement. Moreover, owing to our limitations, when an organ and its function have appeared, we may explain its development though we cannot with assurance foretell its future course. For the lay reader the physiology of Gray shows the anatomical structure of the skull well enough. Descriptively and from the old standpoint alone, it is well treated of by Sverseng, who has lucidly shown how the cranium is constructed to resist blow and pressure from without. He has also shown how an internal pressure, like that of growing beans or of a column of water will expand or burst it—in life we observe the same expansion occurring in waterheads and on account of other internal morbid growths, above all in the younger years of life.

It is the possible outward expansion that is of prime interest to us, since from this we know that the same can be accomplished by the tension of the external muscles attached to it; for although the skull affords a point of origin for them, it does not follow that their traction falls upon the other end alone—the vacuum tending to form by the muscular traction itself favors a rush of blood to the tissue underlying the point of traction. When the brain no longer follows the plates by the formation of new accretions, however minute, and springing from a fission of overgrown cells; when the creature responds only to a certain round of stimulations—though an undue calcareousness of food may also be a cause—the sutures of the head tend to close and various counteractive osseous malformations and devices to form by which the cranial traction is reduced to a minimum. Thereafter cerebral expansion cannot occur without producing mental disorganization and temporary idiocy in the centers concerned. Yet it is a notorious fact that new mental and cerebral acquisitions force older ones into retreat, out of action and partly out of existence. Some variation in position is possible in the areas, but far this cannot go without a corresponding Change ~~charge~~ of osseous and muscular structure on the cranium. Often the old areas rise to predominance again when the later and higher ones subside in connection with nutritional enfeeblement, which first affects the latest added and less stable physical structures.

On the other hand, we do not imply a free play of the cranial plates that, nevertheless, occurs to an extent in some of the lower creatures. A jointed mechanism would be unsuited for a large cerebral mass and a staid associating psychical process. The effects of the cranial musculature, which in the beginning does not approach the size and strength of that existing in the posterior parts of the body, is comparatively slight. The evolutional growth of the brain is and has always been slow, and not because of gregarious and social repression alone. Time is requisite for a true adjustment of the organic parts to one another, and to organic and inorganic environment. This is particularly true of the brain, which plainly shows its superiority of structure and whose growth is not yet complete. Time is requisite for the establishment of those cerebral connections which cause the apparent hereditary transmittance of function, to which Weismann rightly objects.

The point at which the strongest and longest established traction of a muscle takes place appears to be at the greatest curvature of a cranial plate. Moreover, it may happen that some lateralward cortical extension is due, not to the muscular fibres which directly overlie it, but to pre-existing

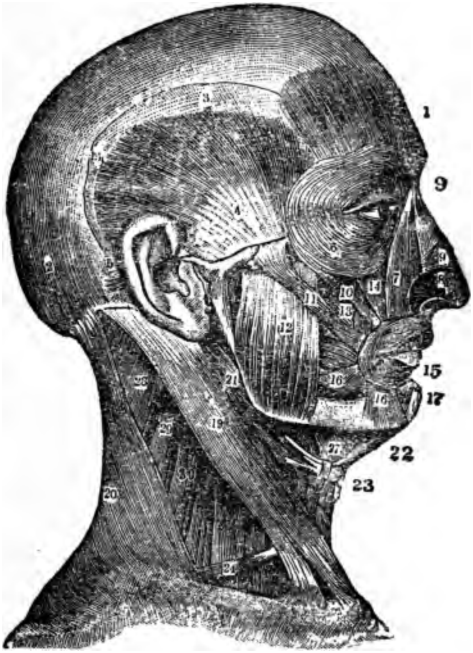

Fig. 3.

CRANIAL MUSCLES.

1 and 2, Occipito-frontal. 3, Its apeneurosis. 4, Temporal. 5, Post. m. of ear. 6, Circular m. of eye. 7, Levator labii et alae nasi. 8, Dilator naris. 9, Compressor naris. 9′, Pyramidalis nasi. 10, Lesser zygomatic. 11, Great zygomatic. 12, Masseter. 13, Levator anguli oris. 14, Levator labii superioris. 15, Circular m. of mouth. 16, Buccinator. 161, Depressor anguli oris. 17, Depressor labii inferior. 19, Sterno-cleido-mastoid. 20, Trapezius. 21, Digastric and stylo-hyoid. 22, Ant. part of digastric. 23, Os. hyoides. 27, Mylo-hyoid. 28, 29, Splenius.

ones. Often it is a question which was priorily existent, the area or the muscular threads, yet that does not matter, for the area is subsequently adjusted to the developed governing muscle that in a measure acts co-ordinately with the originating bundle or sheath. Where, however, two distinct and different cranial muscles lie adjoining the foregoing is less applicable, and in that case there is also the possibility of two quite dissimilar areas arising and existing side by side, as we find the case to be in the spinal segments. One cranial muscle, though it may have some share in it, does not give origin to an area pertaining to another muscle. Likewise, since an area is most likely to come into being under the strain of excitement, its original function is not the normal one; the latter does not appear except under moderate tension; though an area once established may be regulated from the sensory side, the cranial muscles then assuming the proper traction sympathetically.

In creatures of fine brain development the undue basal growth and its premature induration is prevented by a tender parental care; and, of course, when we speak of the brain we must remember the body end. The young suckle the mother and long subsist upon the tenderest diet. They are saved from all constant and extreme exertion, a condition favorable to cerebral association, furthered by the non-constraint of play. Even at birth the neuroglia, out of which the nervous stuff develops and matures, overtops the animal structure more than it does later; the infant's facial angle is the greater. At a certain point the vegetative organism may, however, no longer diminish and continue to support, either from the vegetative or sensory side, the brain, with which it acts reciprocally; it cannot go on to spiritualism and produce responses which are a reflection of reality. Those creatures which become arrested at a low point of efficient adaptation, hampered by solid accretions accumulating in their bodies, consequently lose all capacity and motive for increasing psychical association. The skulls of some animals are muscle-proof at birth and these are the first doomed to destruction upon a serious change of environment. The organic tendency for the accumulation and toleration of calcareous matter appears to have evolved and become hereditary. There was a primordial time when animal life teemed in a sort of chaos, its plastic tissue full of potentialities. The most plastic of the evolved creatures existent today is man. It is by virtue of this protoplasmic and neural susceptibility to change that he became lord of creation.

Those creatures that gorge themselves with food, becoming inert when hunger is sated, even falling asleep and permitting a period of brain anemia to take place while the process of food assimilation goes on, are the least fit for the development of a structure favoring associate psychical activity; their inertness favors the deposit of foreign accretions in their bodies. Such conduct may create an organism possessing enormous innervating powers in certain directions, but these powers are few and crude, moreover, easily circumvented by a superior mind. It favors the deposit of fatty and other somatic tissue between such neural particles as do exist, accompanied by a consequent interference with and interruption of the nerve currents on account of an intervention of non-conductive material and of the non-development of connecting fibres. No part of the organism, newly evolved or hereditary, has ever been proven to come forth spontaneously and to maintain itself in a passive atmosphere. In its loftiest forms mind is therefore dependent upon a selection and reduction of diet, so that the sensitive neural cells over the entire organism may not become clogged and encased in callous tissue. Providing then that all conditions are favorable for conceding the part the cranial muscles played in the cerebral development for which I contend, it may yet be asked why the explanations would avail in the case of the brain alone. I have previously called attention to the segmentation of the spinal tract which physiologists and morphologists have traced, and the principle of muscular origin as set forth within this work naturally follows from that. If the sensitive protoplasmic material had remained scattered through the muscular tissue, sensitiveness and contractility would indeed have been retained, but the muscles would yet have remained sluggish masses of flesh, and perhaps characterized by only the faintest spark of mentality. The sensitive particles at a certain stage began to center in the spinal tract of the horizontal creature. This tract was divided into segments by the attached muscular bands, possessing an independent sensitiveness, each controlling a distinctive section of the organism. The growth of the muscular bands and their improvement developed the spinal nuclei accordingly until, because of length among other things, they were broken up and their direct influence upon the spinal tract became less and less, a state of affairs which favored the formation of the rigid and thick casings composing the vertebrae. It was from this stage on that the neural accretions which tended to form, and naturally tending to ascend, found the least resistance in the cranium and ascended thither to appear as the conglomeration of the brain, while the lifting of the head became more marked and the posture more erect. Here the spinal tract is in a manner reduplicated, but also improved, the cranial muscles acting on the central tract for the bodily ones, the neural currents being compounded with those originating from the sense-organs of the head; though I admit that this compounding began and proceeded to a certain point before the arrest of spinal expansion. If the lifted head and erect posture, among other factors, likewise favored the evolution of the brain, that argues nothing against the part the cranial muscles played, for these were not the sole creative agents of the brain—which, through the modification and elaboration of sensory material, produces the phenomenon of mind out of a simple reflex mechanism.

What I contend for is that the cranial muscles are automatic springs of action for awakening the particular cerebral areas, and afterward, by virtue of the part they took in giving them origin, exercising a vasomotor control in them over and above that arising from the respiratory- and heart-beats. They control the areas independently of the sensory currents and awaken the so-called memories of mind, mind which in the child already varies according to the build of the brain and the cranial muscular operations. Their part is like that, but more effective, of laying or directing a finger or the eyes upon a sense-organ or muscle we desire to arouse to a keener activity or to control. In the same manner we observe people naively lay a finger or hand upon some region of the head in the case of intense mental perturbances, the point touched always corresponding to the particular state of mind. Like the facial muscles, the tensions of the cranials arouse peculiar states of mind. When the cranial muscles weaken for any reason, or are paralyzed, the areas are robbed of their inherited muscular support and thereafter labor under an intense strain; the sensitive cells dwindle away and worthless deposits take their place. In the case of the cerebrum the inner plate of the skull, whose existence permits the expansion of the brain to an extent after the cranial sutures have closed,—follows the sinking surface. Accordingly, sinuses formed by muscular traction upon the skull may be closed up by the pressure of expanding cerebral matter long after the muscles cease to produce any further osseous distention externally.

Thus far we have maintained that a certain degree of organic activity is essential for a thriving mind, but as mind rises in capacity conditions are again modified. In the lower cerebral areas and phases of mind it is a question of momentum of energy rather than of skill. With the ascent of mind the general muscular texture must become finer without the loss of tone. It is an individual's sum of energy that produces his personality. More than one prophet and leader in the world's history rose to his lofty power and position through a course of starvation by which he reduced his muscular bulk and tension to the proper mean and made a fine sensitiveness of his organism real; in conjunction with his course, however, he also put forth the necessary intellectual effort, in taking time for the cognition of sensory stimuli and of the inner associative results of the stimuli. A certain physical quietude, motory inhibition, is requisite for the attainment of the highest psychical results, as even the median stages of mental activity arrest the vital areas and lead to abeyance of the vital functions; of hunger, for instance, or to withdrawal of pain from a wound, a process which, when too far extended, by no means favors healing. Muscular activity purely tends to draw upon the spinal nuclei only. The mystic Swedenborg was not unacquainted with this physical relaxation requisite for a transcendant psychic association—whose products may be either false or true—that he must have discovered of himself or learned from the Hindu. To say, however, that all muscular influence is removed in these flights, is to speak from a lax observation which overlooks almost imperceptible movements. While I do not agree with Goltz that the brain constantly acts as whole vividly, I do not deny that it does operate thus faintly, while one or a group of areas are predominant; some degree of tonicity is ever present in the normal nerve substance. I think we may see a proof of this in an observation of the senses, upon the continual stimulation of which the very life of mind depends. To cut off the senses is to fall asleep and eventually to die. Even in the case of the loftiest efforts of mind the eyes are closed and the senses are shut off momentarily, when then the brain works from the after-effect of sense stimulation, as it were.

From the principle stated in the first chapter and from what we have said in explanation of it so far, we gather that the races of men and individuals are alike because built alike. Their physical structure predetermines the resemblance of their minds and of the potentialities thereof. They differ as their organic structures differ. The composite man will not become a reality until society the world around has become one and lives in a conventionally created uniform environment; not till then will brainal excrescences and "bumps" that produce erratic minds disappear. Therewithal man does not stand in opposition and aloof from the brutes as a creature of pure mind, not even the ideal man. The automatic brute, a little shorn of its brutality, lurks within him. His nether cerebral areas are but fed and enlarged—though a few have shrunken—by shrewder sense-organs, which must be considered at one with the improved limbs, and by more complicate cortical areas. He is capable of a higher moral conduct in respect to feeling, thought and deed, and if he desires to be accorded the rights of man, he must conduct himself according to his potentialities. When he leaves uncontrolled or perverts the powers the increased size of his cerebral convolutions afford him, he becomes worse than a beast could ever become, for these lower areas have partly lost the capacity of a sane adjustment to environment; nor, as a beast, does he know himself and hence the almost hopeless task of transforming even the enlightened ignoramus. A check that too commonly and effectually operates upon the ordinary adult of limited education and culture when he attempts any original mental efforts of any intensity, is that of a harmless dizziness he experiences upon such attempts.

We might now leave the reader to gain further preparatory information from the authors we have mentioned, and indeed he must turn to them for the elucidation of some of the brief statements here made. He may further turn to Hitzig, Fritsch, Fere, Mercier, Maudsley, Hollander, Brinton, Jastrow, Baldwin and Manaceine, not because these or any mentioned do not err, but to learn some truth and the way to more. Moreover, a number of explanations have been added in the second part of this volume.

BOOK II.

EMOTIONS—VITAL

VITAL AREAS.

Base of the brain and the cranial muscles concerned.

According to brain embryologists and morphologists the hemispheres originally were constituted by two vesicles located at the anterior extremity of the cerebro-spinal tract, Fig. 2. Into these the afferent and efferent fibres of the tract were prolonged, there still further to sprout upward, one predominantly in one direction, another in a different one, the whilst maintaining an interconnection. At this stage of development the vertebrate creature inherited an organism already well enough endowed, not only to make a brainless existence possible, but also to give origin to the brain in a skeletal form. Through the simple vesicles it came into possession of rudimentary selfish cerebral emotions, cerebral motory power and even of intelligence. At this initial stage and long after the sense-organs, when they attained an extraordinary degree of development, usually did so isolately, being represented by large cerebral areas whose association was confined mostly within themselves. The connection, area for area, was still direct with sensation, a condition under which the purified and neural association which constitutes INTELLECT is not possible.

Corresponding to the extraordinarily developed areas there was always a large pre-existent development of the appropriate cranial muscles. As a muscle always was served by a sense, it naturally gave location to the area tending to form for that sense when it contracted. Likewise the sense-organ improved parallelly with the neural connections, but these early overdeveloped organs and areas, representing a powerful mental concentration in one direction, were seemingly but tentative devices that subsided again in those creatures which continued evolving. Among the initial functions, which had their beginning on the middle of the basal surface of the cortex, we may enumerate Smell, Taste, the sense of Pressure and that of Touch. But there were others, besides untold modifications of those enumerated, of which we take no conscious note in our everyday finite diagramatic analysis; especially is this true of the senses whose peripheral organs are located internally—with these we appear to be completely out of a conscious contact

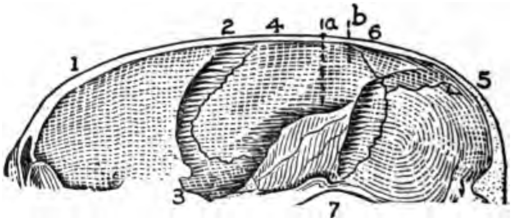

Fig. 4.

BASE OF SKULL—INNER VIEW; RIGHT SIDE.

1, Orbital part of frontal bone. 2, Great wing of sphenoid. 3, Lesser wing of Sph. 4, Temporal bone: a, Petrosal part; b, Mastoidal part. 5, Oc. bone, showing impression of cerebellum and of the lower edge of occipital lobes. 6, Temporal bone. 7, Foramen magnum.

The external covering of the base of the skull is concealed within the cavity of the mouth, yet it falls into the sphere of our subject. From the beginning the mouth was employed as an alimentive instrument, whether of air, liquid or solids; the muscles concerned with the operation of its movable members exerting a traction upon the lower round of the skull, that of the minor ones falling upon the roof of the mouth, upon the sphenoidal bones which have since developed special processes, such as the pterygoids, for the attachment of the muscles. At first the structure was simple and the tension fell upon the tegumentary or cartilaginous covering at the base of the brain. As the vital areas were the first to reach a satisfactory development, it is not strange that, as regards the sphenoidal bones, we find the earliest bone formation out of the cartilage (Hertwig), a recurrence of a process similar to that we observed in the spinal column. An animal scenting either does so with open mouth, or else with an inclination to open it and which does not go so far as the parting of the lips. In tasting the muscular tension is enhanced by smacking, by which a suction is brought to bear upon the posterior part of the roof. In the same manner, to remove pressure from above, the nerves of taste are situated in the base of the mouth. It appears to be because of the primitive absence of a muscular tension at that point that the cerebro-spinal tract forms a bend opposite the throat.

My contention is further supported by the location and function of the deteriorate pituary body, resting upon the sphenoidal bone, its posterior part directly connected with the cerebro-spinal tract. This body formerly, in the days of mastodons, was conjoined with enormous nutritional powers and strong cranial muscular influence bore upon it. At present the anterior part of the body, connected with the sympathetic system, in morbid conditions, which may be considered as reversions to the original type—produces enormous bone growths and the giants of our race today. Injuries to the posterior part, the infundulum, causes an increase of blood pressure. Its removal induces muscular apathy and organic weakness, undoubtedly because of muscular undernourishment, due to degenerations in the digestive tract.

The area of Smell, which functions precedently to Taste, is located anteriorly and rests against the bank formed by the sphenoidal bone, Fig. 4—the olfactory nerve and lobe constituting a part of the spinal tract proper, we shall not discuss here. Since the yearning for taste was not exercised until the food was taken into the mouth and on the way to deglutition, the more backward situated muscles gave origin to the center for that. But most creatures, and especially the lower forms, exercise Touch,

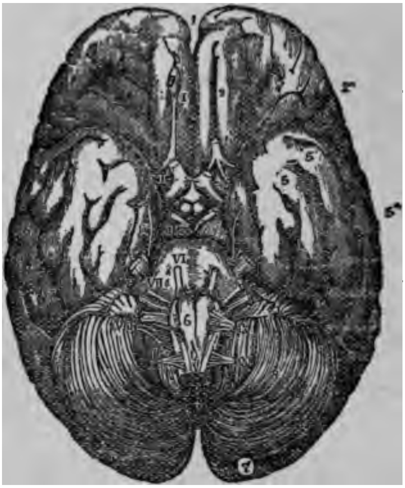

Fig. 5.

BASE OF BRAIN.

1, Longitudinal Fis. 2, Base of third frontal C. 2' and 2'', Second and first C. 3, Fis. of Sylvius. 4, Cornu Ammonis (subiculum); the uncus extending forward of it and the fusiform C. lying backward and laterally from it. 5, 5', 5'', First, second and third temporal conv. 6, Medulla oblongata. 7, OC. lobes. 8, Cerebellum. 9, Olfactory lobe.
(Adapted from Thompson.)

of whose sensory surfaces some are now invaginated and lie interiorly, at least before they do Taste, and the area of that sense therefore might be supposed to occupy an anterior position. However, the cranial muscles employed in feeling are not located in the mouth. They are those deep-seated ones situated around the top of the spinal cord and the magnum foramen, especially on the lateral and backward sides. These rotate the head about, even when the sense is exercised by the squirming body. As for ourselves, we are irrepressibly drawn to look when we touch. In locomotion, relying upon touch, the head takes part with the body. A dog is inclined to rub his body on a carcass before eating of it, and to substantiate other impressions by this sense. Since the finer touch may be considered to have evolved out of a crude sense of pressure, the primitive crude phase of it is undoubtedly that of pressure; the sense of temperature being still another form of it. Later the tactile area extended over the cerebellum, with the function of which it possesses much in common.

These areas lie in the cornu ammonis, uncinate convolution and hippocampal region. Toward the mesial line they are connected with the simplest immediate needs of the organism. In their lateral extension, accompanied by an ascension of function, they merged into the temporal lobes. Experimentalists arrived at the functions—though we must bear in mind that these functions are determined by the connections with the senses, physical organs and other areas—of these regions by various courses. They are large in the lower animals when the corresponding sense capacity is large. The electrode produces confirmative movements in and about the sense-organs particularly concerned. Goltz washed away the cortical matter in the frontal regions without disturbing these lower psychical capacities, and yet it must be remembered that some of the lower cerebral areas can be cut off and yet their parts be taken so well by the spinal nuclei so as to escape superficial observation. In pathological cases these areas degenerate, in some cases from non-use. Cranial topography places an organ of alimentiveness before the ear, at the point where the areas of Taste and Smell touch the vertical wall of the skull. The narrowness or width of this region must, of course, indicate the degree of attention paid to the senses, that is induced by them because of the size of the areas. Remarkably enough, after a certain degree of expansion has been reached at this lateral point of the skull, it is bound down by the gathering fibres of the temporal muscle, which favors the ingestion of the area by relaxation instead of contraction.

But if we bear a strong resemblance to the brute in the make-up of our brain, we do so no less in our expressions and actions. We human beings are not too refined to go through preliminary snufflings and smackings before and in the taking of food. In fact, all our physical actions unbrokenly ramify from the primitive movements made in the taking or rejection of food. In the foregoing preliminary movements we bring into play the muscles within the cavity of the mouth, and not to the disadvantage of our digestive powers, agreeable or disagreeable tastes, smells and feelings exercising an untold influence upon our digestive secretions. It may be said that we strive merely to extract more of the flavors of food in our smackings, but of what avail would the presence of the extracts be if there were no pertinent structure to take psychical or muscular note of them? It follows, therefore, that the idiosyncratic setting of the jaw, which involves oral muscles, has much to do with a normal or abnormal nutrition. For it must be borne in mind that the areas send out a motory discharge; this discharge does not go to the digestive tract alone but is more or less suffused through the entire organism—taste, smell and feeling are in themselves productive of depressive or exhilarative physical conditions, low forms of emotion. Again, these senses may arouse a discharge in the motor centers proper.

Among other tactics we pursue to awaken the areas in question by favoring an increased flux of blood into them through a removal of pressure from above, is that of tipping the head back, a position which enables one to enjoy a meal in a dream, especially under the appropriate peripheral, internal or external, stimuli. A blow upon the occiput or lower forehead may paralyze the area of smell in particular through a concussion with the bank of bone in front, and a clogging of the circulation may cause the stun to persist. In the higher mental life we express many ideas, even artistic ones, in gestures and terms of these low areas. The high carriage of the face and forehead is indicative of the expansion, refinement and elegance of the intellectual tastes. Hanging the head forward quenches these finer sensibilities, on account of cerebral compressions and congestions together. We see, therefore, that a secondary and removed set of muscles become involved, such as took no part in determining the location of the areas and which arouse other areas simultaneously. Even the band of the temporal muscle becomes involved, as we have seen, and were it not that the olfactory lobes enter the hemispheres directly instead of crossing each other, we should, on this account, find the most active half of Smell and Taste located on the opposite hemisphere from that which the temporal otherwise influences.

That surface of the tactile area which extends over the cerebellum, is affected by the muscles which affect that organ; it is mechanically influenced by the contractions and expansions of the cerebellum in so far as the tentorium permits. If the head hangs forward, as it is prone to do when attention is directed toward the body, where many inward pains are referred to the surface, the cerebral bases are relieved from pressure above; and besides there exist cisterns of receding fluids. The centers of which we have spoken in this chapter grew larger, conjointly with others, until the florescence of gray matter formed the fissures along lines of retarded development, and finally overlapped the axis of the brain, including the cerebellum, on all sides.

BOOK III.

PRAGMATIC EMOTIONS—RAPACIOUS

CHAPTER I.

DESTRUCTIVENESS.

That portion of 1 and 2 Temp. C. lying in the prehensive zone, Fig 14a.

In its place the masseter is a muscle of power; of its range, of its psychical as well as physical influence there can be no question. Its inferior end is attached to the horizontal ramus of the jawbone and its upper end, forked in man, to the zygomatic processes of both the temporal and malar bones, some of its fibres also mingling with those of the temporal muscle. Fig. 3. The muscle is subject to many modifications, not always corresponding to psychical character on account of the existence of counteractive devices, in the different genera and species and in the different individuals of the same species.

Primarily the masseter served as a muscle of prehension and destruction for the satiation of hunger. In man it is reduced to the masticatory function, but at the same time it remains as a key to the brain, and regulates the emotion lying back of the destructive impulse. It seems to have developed to extend between the first visceral arch and the outer base of the cavity inclosing the central nervous tube —or developed from the upper vertebrae to be displaced to this cavity—and is innervated by spinal nerves. Its contraction produced a point of least resistance beneath the temporal plate, or of such a part as had developed, and here then formed the cerebral area for a general physical invigoration of the peculiar nature of temper. This invigoration, like the innervation proceeding from the cerebellum, directly supports the limbs which are set into action for overcoming the prey. In man the emotion of temper is so modified that in general it has lost its violence

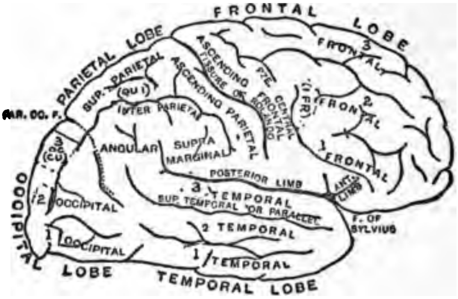

Fig. 6.

BRAIN—R. LATERAL CURVE.

A glance at the fissures shows that the temporal convolutions extend beyond the temporal and under the parietal bone.

The first frontal convolution undoubtedly extends to the summit of the brain.

The ascending frontal convolution includes the evagination lying before the anterior end of the fissure of Sylvius.

(Adapted from Halliburton.)

and volume of infrequent momentary outbursts, and is converted into the direction of stupendous industrial and institutional efforts.

The masseter led to the formation of the osseous process of the temporal plate which enters into the zygomatic arch from behind; but only in those animals which fed upon a tough diet and which required a violent use of the jaws and muscles of the organism to overpower the living prey. Insect-eaters and pulp-feeders, noted for their timidity, possess no arch and muscle at all or else have both reduced to a mere thread. The carnivores, whose victims are often themselves well armed from similar causes, accordingly have developed a most powerful masseter and zygomatic arch. When, however, the masseter comes to exert a degree of cerebral influence which endangers the physical well-being of the possessor by stimulating to inordinate fury, various checking devices appear to insure, or that insure, the survival of the species. The large outward curve which gives breadth to the head of the cat and hyena, weakens the zygomatic process as a lever.

The area of temper, or of destructive impulse for acquisitional purposes, became necessary with the increased evolution of the land animal; it is essential for litheness of body. Animals of enormous bulk, and consequently of physical energy and momentum, like the cetaceans, though they employ the mouth, still have the temporal bone attached almost exteriorly to the hollow of the cranium, where it touches upon a minimum of cortical area. They are not prone to violent temper. A similar conformation occurs in the timid herb-feeders, which are also generally nocturnal in their habits. The bovines, furthermore, swallow their food to soak before mastication. The camel, subject to outbursts of temper—for as to temper it had nothing to complain of in the fable as against the bull, boar or tiger—and capable of unusual endurance, possesses a more pronounced temporal plate than does the ox. The muscular innervation of the ox comes from posterior cerebral areas. The muscles of the lion, constantly kept in a state of tonicity, add to the magnificence of his body; outside of his simple lines of beauty, the ox makes a poor comparison with him. When the area becomes very intensely active the muscles approach the state of rigidity.

Destructiveness, as phrenologists are wont to call the area in question without knowing exactly why, is probably the most appropriate name we can apply to it. Its effects are characteristically subjective, and it wields a strong influence over heart and lungs. Only in pathological cases is the order of operation reversed, and the physical state, not the cranial muscle, arouses the developed area. This leads us to the sensory factors concerned in any instance. An area receives first, an incoming stimulation from some part of the self or from the not-self through the self; second, instead of passing on, this stimulation may keep the area or gray particles affected, as well as the muscular tissue, in a state of vibration, productive of emotion, which is pleasurable or intense and painful; thirdly, the current expends itself motorily by way of the muscles directly or through the mediation of intervening areas.

The inward sensory impression of Destructiveness comes from the regions where hunger, thirst and other vital needs are felt. The excitement of the areas of Smell and Taste, therefore, aid in awakening it by way of the organic tissue; but at the same time these areas may arouse an adjoining one directly through vasomotor diffusion (in regard operations of the brain see Meynert). A hungry beast is an angry beast and a hungry man tends to become murderous, states in which all the senses become momentarily blunted; the difference of threshold being increased. More violent anger in turn becomes mania, which is liable to bring about a disorganization of tissue and dementia. The stimulating fluids created in the system during anger become deadly when they collect in too large quantities. Temper also tends to rise when the upper mental activities are withdrawn; disruptive mania is likely to precede permanent insanity. The negative psychical state of Destructiveness is that of a timorous melancholy; a disinclination to activity; a loss of appetite succeeding later.

The sensory elements concerned from without seem primarily to have been derived from touch and its area; later, they are also derived from the sight and hearing.

But what we have thus far said applies only to the first and second of the temporal lobes. The function of the temporal region, whose early evolution is attested by the Sylvian and the parallel fissures, the first to appear on the brain, is not homogenous throughout, even the anterior tips are preoccupied by Smell and Taste, as we have seen. The more primitive phase of the emotion also seems to repose in the particles now posited at the summit of the lobes and lobules, the peripheral ones and those lying in the sulci being therefore somewhat removed from the muscles. The mysterious tonic influence of the masseter has escaped those doctors who believed they discovered a stimulus for the stomach in the chewing of meat, though meat juices unquestionably are stimulative. Chewing in itself is invigorating. Violent tension upon the masseter results in an intense innervation of the character described in this chapter, despite the secretion of juices poisonous to self and to others. Caged carnivores when in the expectation of even prepared food, mayhap contemplating a human spectator before them, simulate the jaw movements of attack until they actually begin to roar, spring and clutch. A tough steak or other morsel is apt to make a man wroth, as a bone will a dog, and render his jokes caustic. As soon as the head of a child appears at birth—and the jaw movements begin long previously to birth—it works its jaws when yet the catching of a first breath is still out of question. It is the little one's first innervating effort and causes him to begin life in anger. Afterwards the child employs the masticatory muscles at the breast and in working up his temper when crying.

The structure of the food itself, accordingly, has much to do in giving firmness to the character of a people. Nor are human beings alone disposed to chatter when irritated and working themselves up for an attack—it is worth while to stop and silently count ten or a hundred in order to keep the jaws quiet under provocation. The lion falls upon his prey with an open mouth and tensed masseter; and a roar, the result of a reflex expulsion of the increased volume of air preparatorily inhaled, the sound sympathetically terrifying because it denotes a partial collapse of the foe himself. The movements of the jaws, as we have before said, are employed for invigorating effects in ordinary life, but the value of this temper always depends upon a proper curbing. They appear in gum chewing, a habit many persons, nervous girls above all, resort to for working up a brazen front among strangers. Tobacco chewing reduces the man to the capacity of a laborer, and a profane one at that, for he stimulates the lower areas at the expense of the upper. Some persons of weak constitution, by a constant grinding of the teeth develop a very nodule of muscle at the angle of the jaw. The Yuma Indian runners, in covering their astonishing distances, carry a pebble in the mouth. We grit the teeth in anger. The canines run with distended jaws, drawing upon the zygmatic process in that manner, as well as upon the areas of smell and taste.

A weak masseter argues for gentleness and shyness of disposition; for irregular and brief outbursts of temper. A strong masseter stands for a steady vigor and determination, to the extent of brutality. Men of strong set jaws proceed with a sort of ruthless, remorseless advance, not hesitating at bloodshed and war. Under control an intense Destructiveness, which is devoid of pity and conscience, commits slow murder, and delights in torture, whereas formerly it did its work quickly—a close scrutiny of our industrial system will prove these words true. An idiot with well developed lower temporal lobes commits murder easily because of his atavistic organization. Temper is lacking in sympathy; the emotion is utterly selfish. Its area within itself contains little of associative material, and what of that there is present comes almost immediately from the senses. With a routine repetition the activity of the area has become almost completely automatic.

The weight of a large jaw brings a certain tension upon Destructiveness. The tension varies also with the direction the fibres of the masseter take, and when these run forward they aid in expanding the frontal cavity, a fact upon which anatomists incidentally bear me out. On the other hand, it is anatomically known that when in man the zygomatic arch upon one side of the head weakens, the intellectual and forward areas of the same side are larger than normally in comparison to the undeveloped temporal region. The most pleasant-faced man I have known had lost his under-jaw, and what though he was possessed of only gumption enough to pick up what others threw away! The head broad at the base is connected with pragmatic physical movements. Its physical manifestations are predominantly in the direction of appetites and passions. Ideality, spirituality, divination when existent are rudimentary. Insights and aspirations are hazy; the simplest thoughts daze, yet at the same time one so stunted is fortunate in soon forgetting his disappointments and aspirations. If he was not born to his doom—few are so born as far as the flesh is concerned—the mistake occurred in his earliest training; in the lack of ideals presented to him from the cradle, before the skull hardened; or, if not that, his organism was inured to actions of a low and false order, his brain cells were crammed with worthless memories of functions. Our brain capacity is limited and we must govern ourselves accordingly. We can make ourselves this or that, but not jacks of all trades. Moreover, the power of any area varies from day to day, from hour to hour, with the nutritious quality and amount of food, with sickness and health—the control of the cranial muscles is not absolute; they control only what there is to control, and build when there is something to build out of. Enfeebled, the man of fits and passions then begins to whine.

But I cannot close this chapter without calling attention to several more significant facts which relate to the area of temper, the effect of the masseter on which can be artificially tested by opening the jaw against resistance. In this experiment, however, energy is liable to lack concentration and other areas are awakened to interfere. The very attempt at observation would create such an interference. A remarkable fact is that the first gray hairs tend to appear upon that part of the scalp covering the destructive area; gray hairs are prone to follow upon a physical collapse.

Paradoxical as it may seem, yawning is an effort at invigoration, a connection proven by the tension, though slight, brought to bear upon the zygomatic arch in the act. It is said that we yawn because we are sleepy, but that is not saying that yawning puts us to sleep. The approach of sleep is marked by a certain sinking of vitality and consciousness and it is to counteract this depression that the yawn is indulged in by brute and man alike, despite the fact that, conversely, it tends to induce a sleepy feeling. When the monotony of environment favors the lowering of the level of consciousness and we begin to feel drowsy, we attempt to brace up by stretching the masseter, stretching the body simultaneously to favor the circulation of the blood in its service of the nerves. A delightful sensation of invigoration follows, and one which is far from reaching the level of anger—once angry we experience no further trouble in remaining awake. So, in a round-about way it also happens that yawning expresses a yearning for love and its play. So likewise the cough, sneeze and shiver are effective means for throwing off a chill, for in these acts the invigorating influence of the masseter is involved concomitantly with the local effects they produce. In the case of the sigh, a soothing tension of the masseter aids the organism in making use of the supply of oxygen inhaled to repair the damage done in a period of abated breath and arrested functions.

The following scheme, an example of others appearing in this work, shows first, the cranial muscles regulating the area of constructiveness; second, the principal sensory element, of subjective or objective source; third, the psycho-physiological state; fourth, the organic and muscular effect of the efferent current.

Destructiveness,
  Masseter.
  Hunger, primitively.
  Temper—Mania.
  General organic invigoration.

CHAPTER II.

VIGILANCE.

That portion of 3 Temp. C. lying in prehensive zone. Constructive phase lies in constructive zone.

If our conclusions are right then the original brain vesicles, and it matters not though all is due to tropisms, contained within them in miniature, the principal ones of the later cortical areas and corresponding psychical functions, though in their manifestations they varied as to acquired details—probably the result of difference in neural connections and physical organs—in each individual life. These areas were determined by masticatory and other cranial muscles and by the co-ordinately active tissue or members of the body, such as they were, the areas reciprocatively improving the organism. As creatures change and improve now, so they improved then, ultimately in accordance with some phase of environment. Weismann's hereditary influence enters when the modification undergone by some members of a species and not by others is transmitted to reappear in the structure of the offspring of a pair, male and female.

A measure of contemplation and purer emotional experience must always be credited to every vertebrate animal of marked sensitiveness, and these states are the results of neural associations which take place in moments of quietude. The cerebral areas do not receive the direct effect a stimulus creates upon the nerve ends at the surface of the body—these all pass through the optic thalmus to them. The modifications of the effects within the cerebrum, moreover, increase upwardly, concurrently with the increase of sensitiveness of the sensory system. And though we forerun ourselves in doing so, we may here locate at the top of the vertebrate brain, and anteriorly, the highest form of association and causal insight.

The primitive areas, therefore, did not remain behind and at the base of the brain in the course of progress, but they expanded, improved and differentiated, continuing in their respective positions. With expansion their functions likewise increased in breadth and depth; in reinforcing power, intricacy, skill, capacity for abstraction. There was a development, not only in the brain as a whole, but also within each area, as we have seen the case to be in Destructiveness. Yet, even more, a faculty running into that extreme when it exists for its own sake and out of proportion to the great round of environment, becomes self-annihilative.

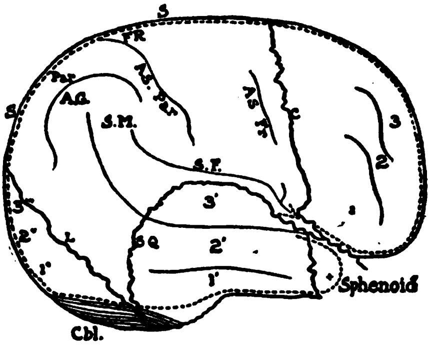

Fig. 7.

The above diagram speaks for itself as to the relative positions of the cranial plates and of the divisions of the cortex. See Fig. 6.
S., Sagittal Suture. C., Coronal S. SQ., Squamosal S. L., Lamboidal S. Cbl., Cerebellum.

Changes in function may possibly take place when a particle and its connecting fibres become weakened on account of long disuse, mayhap because of the suppression of the use of its particular sensory nerve end, another function, then, consistent with the cerebral location, being forced upon it. This new function, under the proper conditions and stimulations, can again be displaced, and completely lost, by the reappearance of the old, or by another new one. The accretions to the cerebral areas always maintained a medullary connection with the receding areas, often reaching the muscles through these only; the adjacent areas remaining in the closest contact, favoring the quickest passage of the neural currents and making the phenomenon of human mind possible. In this differentiation the response of an area from core to upper cerebral periphery is sometimes so far transformed as to be hardly recognizable, differing more infinitely in its transformations than does the sight of man in its comprehensiveness from that of the brute.

The tonic effects of Smell, Taste and Tactility are well known. Each, though prompted by an organic want, energizes in its own sphere, at its own points of the organism, leads to physical activities. But the energizing effect of sheer force, of Destructiveness, the center of inward muscular energization per se, necessarily reaches a limit of motory expenditure because of the physical structure, and when the physical wants are satisfied. That is at the point when the creature is able to overcome all obstacles standing in its way for the satiation of appetite and maintenance of physical life. A new tropism (Loeb) now may or may not arise. Without the emergence of new aims and obstacles to be overcome, the creature would have crystallized into a hopeless automaton. For the carnivores, and these, including man who evolved out of a carnivore, mainly serve us in the illustration of our theory, the prey in time became warier as well as scarcer. Thereupon secretiveness or vigilance and its organ, not prominent in the lower mind, became imperative next in order. For, under the existent physical conditions of earth, and constructed on the plan that he is, the evolution of speed or other advantageous bodily devices are almost out of question. Vigilance, whose area lies in the prehensive zone, in the third temporal lobe—the tip of which marks an ascent of taste—covered in the main by the temporal bone—is also an area of invigoration, but it acts inhibitively, with an inclination to recoil, instead of taking an outward violently aggressive direction. It receives its stimulus from the inner tissue, like Destructiveness, but also from an improvement of hearing, for prehensive ends. Hearing, since it yields very incomplete information regarding the objective world, naturally leads to shrinking and guarded action. Motorily, therefore, and the whilst listening, Vigilance induces those soundless movements of cunning made in stalking a prey. It functions longer and more steadily than the lower area. Listening in the main and emotionally calculating upon the sound heard, the beast of prey steals upon its victims, not in a full energy, that is now partly consumed in the vigilant process, but still with intermittent flashes of anger plainly leaping into its eyes, as we may observe in the case of a cat thwarted by an elusive bird. The tension of the masseter is moderate, but enough to draw outward the upper rim of the squamosal bone, beneath which the greater part of the convolution of vigilance lies, and that describes the widest arc and feels the first effect of the muscular contraction.

On the other hand, since the hunted must likewise exercise an increased caution to insure their safety, Vigilance develops in the two divisions of animals synchronally, in the same manner as Destructiveness does. Usually Vigilance is the less conspicuous in the defendants, and these also place more reliance upon other sense-organs than the ear, so that we must conclude that optic and other fibres, not auditory ones alone, enter the area. As a rule the duty of guarding, with those creatures living gregariously, is assigned to one or a few individuals, special effort being necessary to keep Vigilance on the alert. Necessarily the carnivore, subsisting upon an elusive prey, through the additional organic energizing power he possesses in a voluminous Vigilance, tends toward the higher mental development, providing the proper sensory factors are co-operatively active. His size is reduced from bulk in the direction of simplicity and litheness; of finer and varied peripheral nerve ends and muscular bands.

Electrical stimulation of the third temporal convolution causes a prickling of the ears—the molecular movements of glands, viscera and tissues have not been determined—a turning of the head and a dilation of the pupils of the eyes, but these latter movements appear to be concomitant and secondary effects that go with hearing. Hearing, after the inner organic feeling, normally is the pre-eminent external sensory element of Vigilance, an advance over blind brute force. Loeb has demonstrated that the stronger vibrations of a living body force others to beat in harmony with them, whence it follows that the superiority of two centers is reciprocal in action. When Vigilance is in the ascendant, Destructiveness, although tending to activity, is in abeyance; but the controlling power of hearing acting alone is limited. When the object, of sufficient potency to further arouse the alimentive sense-organs, the sensory keys of Destructiveness, comes within a certain stimulative distance, the jaws are brought into stronger action, whereupon destructiveness supersedes vigilance. After prehension still lower areas assume their turn.

But we have yet to consider the origin of the area of vigilance more closely. The accretion forming it would occur when the baffled masseter, now joined by the temporal, was in some state of contraction, causing a congestion of its cerebral center, and would take place upwardly upon the margin of Destructiveness, toward the edge of the squamosal plate, in the direction where the thinner edge of the cranial plate offered the less resistance. The new function remained under the jurisdiction of the masseter, or, rather, under certain of its fibres and tensions. But the pricking ear, especially when drawn somewhat outwardly in half anger, also plays its part, through suggesting tension at least, by means of its superior muscle. Even the human ear lying close to the head is not a good ear for sound reception, despite the fact that one may after a manner enjoy the study of sound relations. But, again, an ear projecting coarsely from the head does not indicate a fine capacity for sound distinction; it betrays a certain low emotional phase of hearing for noise and scattered sounds, and of cunning combined with suspicion.

If from a defect of the apparatus of hearing, evolved within the first visceral cleft, the cortical center, when inborn and endowed with the inner sensory connections which are subject to stimulation, is not satisfied, there results the characteristic shyness and suspiciousness of the deaf, particularly that of those who were once capable of hearing. [1]Suspicion results from a positive or negative, perverse activity of an area whose sensory tension is unsatisfied and whose material is essential for a rounded mind; it may have its source in a state of the tissue. Even when the ear is perfect nothing induces suspicion quicker than whispering by others which eludes our auditory grasp. But the deaf from birth, unless they inherit a large secretive area, are notoriously unsuspecting in their actions, and thus come to manifest a naive and simple vigilant secretiveness that is faulty in so far as it is unregulated by sound. So it is with the blind also, for sight is connected with even a higher stage of vigilance, the first step in whose education must be the understanding that they are under observation. In some substitute manner the isolated areas must receive the sensory stimulus of external source. A large area of hearing demands an enormous experience, even when there is no defect in the sense-organs, otherwise it will exhibit its morbid dissatisfactions. Beethoven found relief from his suspicions through the exercise of sound imagination, and diversion of the circulation from the area of vigilance to that of tune, in the tempestuous outpouring of emotional music.

Vigilance supplies another aim of life, and these aims are most powerful in sustaining animal energy. It is conservatively innervating and does not run to a maniacal frenzy, unless it is in the rare frenzy of cunning. Vigilance awaits the opportune moment to strike, by inhibiting some muscles and quickening others, the whilst a low and constant wary muscular innervation is maintained for the supreme effort, whose source is partly in the area of temper. It aids the hunted in regulating their protective movements and those of escape, but since these possess a small organ—which has much to do with their flabbiness and clumsiness of body—grace of form and movement which sound induces nevertheless, they are especially confiding and artless creatures in domestication, in contrast to the felines and canines that are quick to suspicion.

From the point of regulating the internal muscular tensions and concealing the bodily movements, Vigilance, when surcharged from within, easily extends to the concealment of external objects, as those of food. After that it deals with the forces of nature and psychical energy. The complexity of its operation in man, with whom it becomes subject to grand moral and ethical laws, is almost incomprehensible; by it he strives to maintain a consistency in his thought systems. Moreover, to fully grasp the capacity of the area, one must himself possess the equivalent underlying cerebral support. One understands best what he himself can experience or has experienced.

Inevitably the feature language of Vigilance is a tempered form of that of Destructiveness. We are inclined to listen with the mouth slightly open, an attitude which has hitherto never been satisfactorily explained; the tension upon the masseter being just enough to induce a sort of fear, but not enough to induce destructive impetuosity. In the lower animals the mobile external ear, in conjunction with the massetral and temporal muscles, plays an important role.

Before concluding we must say a few more words in regard to the results obtained by experimentalists and those that occur in pathological affections. If the upper temporal lobe is removed there follows a deafness to certain higher variations of sound, such as are taken into account by the secretive stage of mentality. The lower creature takes note of only those sounds which are of interest to it in its narrow round of life, and grasps them vaguely; it hardly possesses the rudiments of the musical area. To one whose upper temporal lobe has in any manner become useless, the sounds of life are as valueless as the "music of the spheres," and spoken language itself is no longer completely understood—a morbid suspicion misinterprets in guessing at what it does hear.

Leaving out of account the organic factors which cause similar states, the power for sound perception depends, over and above healthful appetites, upon the health of the auditory cerebral area and its potentiality for stimulation. When deafness is present there is, in addition to the emotional, vacillating depression, a sickness of limbs; a certain direct bluntness of action, devoid of all the polish that a refined and proper physical cunning yields. Cunning is imperative because of our limitations; in default of knowledge a resort to expediency must be taken. But if the frontal, intellectual areas of the brain are removed, the sound conducted to the auditory area tends to produce an inordinate brute cunning—the element of inhibitory associative meaning not being introduced. The case is the same where the intellectual associative activity which constitutes music is absent, whilst music lacking the emotional phase of sound constitutes a mere jingle. Since the acoustic area stands in a commissural connection with the cerebellum, sound also has an important bearing upon the equilibrium of the body, although less so in man than in inferior animals.

In conclusion we may add that the open mouth of speech manifests a lack of prudent secrecy. And who displays more cunning in her wordiness than a gossip! She is confounded by the very maze of cunning she weaves. It is silence and effort in a different direction which is lacking in her case. Again, since the area of vigilance operates below the level of consciousness, though its activity can normally be controlled by the willing of it, and is looked upon as objective, many persons thoughtlessly naively manifest it without being aware of doing so. Accuse such persons of a pernicious cunning and they become highly offended and, mayhap, flatly and sincerely declare the accusation false. It is one of those psychic phenomena which is better observed objectively than introspectively. In fact, it appears to be owing to man's inability to observe the lower mental phenomena introspectively, and to his negligency in interpreting their objective manifestations, that he has stupidly separated himself from the rest of the living universe.

Vigilance,
    Masseter.
    Hearing, principally.
    Objective watchfulness—Suspicion.
    Inhibitory.

CHAPTER III.

SELF-DEFENSIVENESS.

1 Temp. C., in preservative zone. Courage lies in the extension of the 2 and 3 Temp. C.

(SECTION I.)

The muscle of self-defensiveness, the protective concern for the well-being of the physical self, primitively, is the splenius capitus; and the sterno-cleido-mastoid, whose office is to turn the head from side to side and to extend it. This muscle, like the masticatory, is paired, and at its upper end is attached to the mastoid process directly, spreading from that point somewhat over the wings of the occipital bones. At the nether end it forks, one division running to the sternum and the other to the edge of the clavicle. The muscle is probably a differentiated piece derived from a primitive muscular band attached to the upper part of the spinal column. It is not evolved from the visceral arches, and is innervated in man from the cervical region by the spinal accessory. Its modifications in various animals are many. In some, that lead a tolerably safe life, it is weak or its influence is in some manner rendered insignificant—but we may here observe that nothing is added to the safety and endurance of life by such immunity from danger.

The emotional concern for the physical weal, springing from an area which primitively functions especially with respect to the trunk, the limbs and head touching it but slightly, is not an unnerving fear, except in the negative *manifestation.* It is emotionally energizing in a definite direction; its motory expressions being characteristic and completely different from those of Vigilance and Destructiveness; even as the sources of its sensory material differ, they being those of touch and pressure. It is an essential faculty entering into the make-up of the "fittest" and would seem to be the principal center of the instinct of self-preservation, in contrast to the alimentive instincts. Upon the cortical layer, situated at the base of the vertical self-preservative zone, the area is located in the posterior extremities of the lower temporal convolutions, opposite the basal tactile area. Touch a worm and it will throw itself from side to side, actions in which the muscles which answer for the mastoidal take a leading part. The creature experiences, in a blunt way, an unusual or disagreeable sensation and resents. It was in this squirming that the reinforcing cerebral matter tending to form, gathered beneath the head of the mastoidal, for reasons we need not restate. Interior disturbances, occurring less often, cause no less and a similar squirming, more notably in lower life.

Before the occipital lobes developed to any considerable length, the mastoidal representative must have acted upon the anterior and lateral part of the cerebellum; and cerebellar responses, now emotionally colorless, were probably the crude starting-point of Self-defenseness through disturbances of the body's equilibrium by gravity, or by any external agent and before voluntary movement had much advanced. The added cerebral area came to the aid of the cerebellum to maintain a balance and more. Associatively, ears, eyes and the other senses became more extendedly involved in the progress of time.

Emotionally, Vitativeness feels a concern for life, organic freedom and equilibrium. Motorily, it acts in self-defense in repulsing alien disturbing agents. This interest, as we have seen, is not solely related to outward defensive action and carriage of the body, but also, through the extension of the zone upon the base of the brain, to food in its mechanical effects, behavior, the higher psychical functions entering upon a higher cortical level after the center has become located and inheritable. In man it is related to hygienic matters and moral conduct, the spinal accessory nerve probably enhancing the variety of the mastoidal contractions. When the mastoid cranial plate—which developed independently and later anastomosed with the temporal bone—is small or absent, there is an unconscious lack of sensitiveness physically and an incapacity and lack of force for self-preservation. Contrarily, one having a large self-defensive center and a fine sensitiveness, is moved by a feeling which unbeknown to himself prompts him to avoid, undauntedly and by force rather than skill, what is mechanically hurtful and to choose what is physically beneficial without going through costly experiences over and over. Occasionally his naive concern will crop out in his speech. In the lower animals the upper phase of the emotion is of low degree, and whether they succumb or survive on account of oversight and mistakes, is much of a matter of chance with them. Those with a small area are easily won into man's confidence, their fearlessness plainly resting on a different basis than that of a small Vigilance. They are easily destroyed, unless they have some natural weapon of defense or reflexive trick of defending themselves, like the opossum or porcupine. In ordinary surroundings these same creatures exhibit a remarkable lack of fear of harm, but this is not courage and they are easily vanquished.

In times of equanimity the head is not turned upon the upper extremity of the vertebral column, but in moments of danger, arising from real or illusory causes; in the purposes of life and in the care we feel for our fellows, the head is turned or thrown from side to side, more likely than that it is held straight forward through a symmetrical contraction of the mastoidals. One who is on the verge of experiencing an injury or dreaded event is prone to rock the body with the movements of the head, especially if action is inhibited, when the emotional fear more and more takes possession of body and intellect. In this case the tutelar area is confused and its state is but made worse by the continued intense mastoidal tractions. When the head is but turned from side to side to satisfy curiosity by means of the eyes, ears, nose or touch, the milder tension of the cranial muscle produces no noticeably spasmodic psychical effects. Nor is a strong area easily perturbed; it feels its self-sufficiency. In the case of physical weakness, Self-defensiveness is liable to excitability from within, but its operation naturally, through the removal of the sensory connections and weakening of the mastoidals, becomes feeble, so that with the approach of the end of life, the fear of danger and death tend to disappear—life being then actually exposed to error and peril from all internal and external sources. A strange characteristic of age, however, is that which strives to the last to preserve the integrity of the psychic self whose physical support lies in the cerebrum and its internal connections, and is governed by epicranial muscles whose weakening is favorable to its activity.

But, not indirectly like the masticatory muscles, the mastoidals perform a physical office in respiration by directly lifting the upper part of the chest, and increasing the lung capacity for the reception of that important element of the vital process, oxygen. Neither do they necessarily exert their force at one extremity exclusively. The respiratory effects observed in the play of destructiveness seem therefore to be caused by the co-ordinately active vitative area. The passive muscle may be acted upon by external force, as when we fall asleep with the head lying upon a high pillow. In sleep the muscle should be relaxed to free the mind from all anxiety for the safety of the self, but when now one or both of the muscles are stretched, and movement is inhibited, the psychical result may be a dream that awakens the sleeper with the sweat of deathly fear standing upon his brow. This phenomenon brings us to pathological cases that especially emphasize the point in question. But in them, as in normal cases, a single area is rarely affected alone. We must resort to the sifting process and learn from the experience of many observers.

Those unfortunates suffering from a wry neck can to some extent obviate a tension upon the vitative centers by relaxing, adaptive positions of the head; less so is this possible when the muscles are affected by spasms. As a rule, however, the wry neck is brought about by a backward process, so to say, by an harassment of mind or vital afflictions which affect the vitative area, causing some abnormal condition therein, the cranial muscle responding sympathetically, and, in turn, intensifying the mental state; so also the lesion of an area leads to perturbances of the nervous system and the organism. I have seen a wry neck produced in a male house cat which was several times badly frightened by objects hurled at it to break it of an objectionable habit, though its neck muscles also probably had been stretched upon one side and the cerebral area injured at the same time. The animal exhibited an unusual nervous fear of life or injury for several months and then gradually recovered its natural carriage and equanimity.

A few clinical cases of both wry neck and mastoidal spasms from an old work by Sir Charles Bell, in which there are happily some disinterested observations upon psychical phenomena, will further illustrate the point:

Case LXXIV. Wry neck, induced by harassment of mind.

Case LXXVI. Wry neck in a woman after the strain of childbirth; anxiety increased the jerkings of her head.

Case LXXVIII. Fear of death came in sleep. Here, if there was not some internal pressure called forth by a distorted lying posture, there must have been a pressure upon the area or tension upon the mastoidals in some other manner.

Case LXXX. Harassed by family troubles. This person was always relieved of the muscular disturbance in the quietude of sleep.

As it happens in the case of any cerebral area, prolonged and intense application of self-defensiveness finally gives ideas bodily form, phantom persecutors whose lodging may come to be in the visceral tissue, or organs, of the afflicted one. The persecuted being becomes possessed by the one aim of escaping the persecutors. Blind to everything else, even the unconscious operation of all superior areas being eclipsed, he will dash himself to death in the struggle to escape. The prolonged stimulation of alcohol results in delirium tremens. If in these cases the entire lower temporal lobes become involved in the congestion, the victim is liable to become dangerously destructive of life and property. Anemia will not develop strong hallucinations of persecution, if any; even real dangers to life escape it.

The symbolic play diverging from the normal upwardly or downwardly, of the mastoid muscles is considerable before they produce abnormal psychical effects. In courage—the area of combativeness back of the ears, and developed by Spurzheim out of a discovery of Gall—a higher rationalized form of self-defensiveness, the neck is carried rather firmly and straightforward. Courage, located on a higher associative level, extends to the point of heroism. It is a most powerful emotional battery of a physical order. Animals are not conspicuous for the display of premeditated courage, for its area lies within the occipital region, undeveloped in them; but they have peculiar ways of giving warning, even lonely individuals, by the voice in conjunction with contractions of the mastoidals —the spinal accessory nerve also innervates the larynx. An ox, sheep or horse will shake the head most emphatically, even at irritating inorganic objects. Carnivores generally at the same time snap with the jaws in a sidewise movement, displaying the intermingling force of the destructive area. When animals, however, once throw their heads from side to side somewhat violently and confusedly, they are, as a rule, on the point of turning tail, and employ this means to counteract the approaching defensive collapse. A straightforward open jaw, supported by not too violently tensed mastoidals, is dangerous to meet. The traditional courage of the lion, though in flight, is expressed in the brave and noble carriage of his neck.

The ear, too, by virtue of its posterior muscle, has a bearing upon Self-defensiveness, at least in a measure, for its influence extends farther backward in man, in whom an ear laxly drooping or standing forward independently of anterior muscular tension, indicates a small occipital development; it indicates a low self-defensive resistance, unless the weight of a large ear acts as a substitute for active muscular tension. The ears of domestic animals are apt to hang. How different is it with the ears of their wild cousins who are ever upon the aggressive alert as a self-preservative necessity. Hollander has shown how perturbances of the area are closely related diseases of the ear and defects of hearing. The relation is accounted for by the proximity of the area to secretiveness and to the apparatus of hearing; the ear is also a direct sensory source of information, particularly in the area's upper sphere. A sore upon the auditory apparatus is in danger of running into the adjoining cortical tissue, and conversely, disruptions of the cortical mass are liable to attack the organs of hearing. Similarily ulcers upon the mastoid process are liable to descend into the cortex.

(SECTION II.)

The language of Self-defensiveness is almost inexhaustible in its variety. It is unmistakable, emphatic and understood by savage and cultured men alike, around the circle of the globe. As gesture language it rarely requires interpretation, which is a proof of its emotional character, but conventionality and the entrance of superior mental processes suppress some of the cruder movements; its elimination is equivalent to psychical untrustworthiness. It is common to both man and animals, but an increasing mentality increases its complexity and intensity, making shrewd observation and a correspondingly developed area necessary for its recognizance.

The shake of the head is employed almost universally to signify "no," and because the matter rejected is a something or somewhat objectionable and inimical, either to the physical or psychical self or to both. The rigidly extended head is a more forcible negation. Both attitudes come spontaneously, but the shake is really a double gesture, after the manner of reduplications in words. The simple non-aggressive gesture is made by turning the head away; moreover, wonderfully enough, owing to the position of the contracting mastoidal, the cerebral center played upon is appropriately situated on the cerebral side which naturally comes into action to innervate that side of the body where the defensive movements also begin; hence the inexperienced are prone to draw the head back upon the aggressive side. In a direct attack the mastoidals are symmetrically contracted and act in conjunction with the posterior cervical muscles. When the centers of smell and taste are also brought into play, the chin is tossed up and the sneer appears at the angle of the nose, however, also on the side opposite to the active mastoidal. Those few peoples who use the nod for "no," employ the occipital muscles in doing so and the more aggressive counteractive gesture.

But where can we find isolated simplicity? Interdependence and complexity face us everywhere, though confusion is of our own making. It devolves upon us to discover the nature of the adjustments. *The effects of foods and medicines depend largely upon the development of the cerebro-spinal system,* a fact the medical fraternity fails to note. The vitative muscle runs in contact with arterial trunks and the pneumogastric nerve—pressure or the removal of pressure affects these inhibitively or stimulatively, thus reflexively affecting the respiratory and digestive processes for good or ill. The muscle causes movements of the atlas and axis, influencing hearing and sight, and other senses by affecting the special nerves of other organs. Thus the mastoidals appear to continue to regulate the segments of their original attachment in a round-about way. We hold the head still to listen; we shake it to command silence. In the affirmative nod the respiratory center in the "vital knot," is excited by the fall and rise of the head. The nod, by the relaxation of the pair of muscles in question, expresses a yielding, but this expression is fortified by the return to the erect attitude and full lungs. When the firmer stand is not called for, we have the gentler response of courtesy, in which the suggestion of a jarring and rough vigor or hostility are banished; here an element of adult play enters in concert with earnestness.

In a resolute struggle for life, and that may occur in combatting a gnawing disease, the head is held firmly from the sides. The hanging head, together with the listless brute ear, implies a despairing mood of life which the most imminent danger only could dispel. Shyness, modesty, shame are expressional forms of a sluggish self-defensiveness. We admire these virtues, but there is a weakness in them, and their opposites are the more admirable, at least as long as civilized life remains more or less predacious. The Greek goddess who frankly and bravely spurns all lovers, openly maintaining her personality inviolate, is unquestionably the worthier character—what though there is such a thing as the erect, shameless head, in which the brain suppresses inherited traits by effort.

Confidence in another permits the neck to relax and the head to fall upon the shoulder or breast of the trusted one, who then assumes the responsibility for two. In moments of enjoyment, when no thought of danger and no physical discomforts exist, there is a disposition to let the head drop, though the healthy, normal muscles then exhibit no lack of intonation. In sleep, free from care, the head easily rolls in any direction, the limp mastoidals offering no resistance.

Bearing in mind that the upward extension of the mastoidals induces a buoyancy of self-defensiveness, because of an increased lung capacity, and that their tension upon the mastoid processes, when the senses act concomitantly, causes more serious attitudes, we can easily interpret other movements and feints. As we have the nod of command and the shake of denial, so we have the thrust of the head, as if we would hook with a horn,—the unicorn being the more formidable but the less dexterous; the relaxation of one side of the neck coincidently with the shoulder shrug of helplessness, which would seem to indicate a relaxation of the mastoidals from below; we have the attitude of pride; that of fearless avoidance. When the platysma contracts also, under the impending or actual dash of cold water, we experience a dread of a physical surface impression. In the expressions of wonder, astonishment, terror, joy or ecstasy there is always a characteristic tension of the mastoid muscles.

The inborn area of self-defensiveness accounts for many childish unfounded outbursts of joy or fear, in health and in sickness. If the lower nervous system, or imitation of superiors, causes undue contractions of the mastoidals, the feeling induced will be morbid accordingly; parental protection often makes the condition worse by fostering a weakness. The healthy child turns the body rather than the neck and head, facing the issues fairly and squarely. The wrinkles upon the sides of the neck, transverse to the muscles, appear the earlier in life, the more an impotent body is filled with nervous fears and worries regarding objective impressions.

Absorbed unduly in external matters and in the affairs of our present industrial regime, the adult, ever attending to exterior and far-removed affairs, leaves uncultivated and even loses much of the instinctive concern for the welfare of his body and mind in the presence of serious dangers; all he is capable of when he feels his selfish needs at all, is to worry over them. Yet the things he does strive for fall short of satisfying him. He acquires them at an immense expense of energy, be they beneficial or baleful, just because the herd does. It is not long before, with disconcerted movements, he begins to look for the fountain of youth, his vitative instinct immature or stunted. Even the vain pride in his wealth, amid legal safeguards, stamps its wrinkles upon his neck, although he is saved the mortification of having the world see and mock at his shriveled brain, or brain stocked with chaff. Still, at best we cannot look for smooth, untroubled and unwrinkled features except in the pictures of saints and angels, whose originals know not and therefore are not scarred by the sorrows of earth.

Self-defensiveness,
  Mastoidal; splenius capitus.
  Tacility and objective senses.
  Self-watchfulness—Persecution.
  Defensive attitudes.

CHAPTER IV.

CAUTIOUSNESS.

Supra-marg. Conv. and Ang. gyrus, Fig. 6. Conscientiousness lies in the upper part of these Convs.

A man or brute in action and prompted by Vigilance in its rudimentary stage, or by any of the lower areas, displays a characteristic vacancy of expression because of the simplicity of the mental operation concerned. There is a lack of the manifestation of a higher cerebral ingestion upon the face and in the eyes.

With Cautiousness, which escapes the masseter, except as some of its fibres join the temporal, and the mastoidal, but not the temporal muscle—an area concerning which we might repeat much that we said of Self-defensiveness—we take another step upward into a broader psychical field; into what may be called a more rational self- and race-preservative emotionality; into the ideal zone of the emotional moral sphere. Here there is an improvement and predominance of eyesight; a yearning for light and sight; and sight is the most comprehensive of the senses, though the light-feeling is also of a wide range. Psychical complexity inevitably follows.

The temporal is generally looked upon as the principal muscle of mastication. The masseter is rather the muscle of prehension, but it also comes into use when the food to be masticated offers a strong resistance, the temporal doing the work in the lighter mechanical grinding process. The masseter tends to act upon the posterior half of the *jaw-bone, though* its powerful energy is felt over the entire length. The temporal acts upon the incisors and canines in ordinary exertions, in minor prehensive efforts; in longer duration. It proceeds at leisure and with a measure of care and study when the food lies before it. This study, which necessarily favors the evolution of mind, principally devolves upon the eyes, as may well be seen in a dog or lion devouring a bony morsel of raw meat. Cautiousness acts above all when the preparatory work of Vigilance and of Destructiveness is done; its range far transcends nutritional aims. It is the next preservative stage beyond courage.

It is evident that the occasions for the use of caution are not greatest in the carnivores, nor yet in the ruminants. Its area developed more conspicuously in the rodents, which must ever study the situation, yet the rodent that burrows in a soft earth exhibits a decidedly less caution, with the concomitant exercise of sight, than does a rat. I do not know how the gerboas manage to excavate through caked sand and stone, but they certainly do it by some means which requires little effort from the masticatory muscles, and tension upon the temporal and parietal plates. Their temporal muscles are weak, and instead of using caution to make their escape in open they depend upon their bounding speed. They undoubtedly, unless they possess a mechanical protective device, employ a dorsal mode of energization, after the manner of the ruminants, whose eyes are constructed for an unusual range of sight.

Cautiousness lies beneath the central part of the parietal bone, beneath the posterior end of the temporal muscle over, but outwardly from, the region of the ancient pineal eye, and above other inferior parts, but upper surfaces, of the brain concerned with sight. The forward end of the muscle *is attached to* the coronoid process of the nether jaw-bone, Fig. 1. In the brute its fibres, and not its upper margin, tend to run horizontally forward from the parietal region, from the supra marginal convolution and angular gyrus, an arrangement which reduces its anterior cranial influence yet emphasizes the posterior. In man it becomes fan-like and spreads far forward. The parietal prominences were undoubtedly next to the first points upon which the temporal was extensively exerted. From thence it gradually spreads forward with the degeneration of the prognathous jaw. Nevertheless, a differentiation of the cerebral function beneath takes place with this spread of the muscle, all the parts and fibres of which do not act simultaneously—and no one will dispute that the various positions of the lower jaw all have their expressional significance. The variety of these movements, of course, increases with the extension and depth of the cortical surface; as their force also does.

Cautiousness depended, on the physical side, upon an improvement, or tension for an improvement of the eyes, both in sensitiveness to light and ocular motion, to furnish new psychical material, although physical want mainly inspires the psychical want at the base. The intense activity of the center, which lies in the idealizing zone, produces a glow in the eyes often sufficient to hide the pupils. The incautious eye is, in a large degree, a lusterless eye, but the occipital and other lobes induce a lustre of their own. Whether or not a person's mind is on a cautious guard can instantly be detected by a glance at the angle of the eye.

The motor impulse of Cautiousness is not direct, perhaps not even to the eyes. Its current does not go over a short arch and out to some definite muscle or set of muscles to produce molar movement. It primarily effects *molecular* vibrations in the viscera and organism in general; but it does turn into outward avenues, or it may be expended in awakening other mental operations. Thus it adds a motory veneering to the body through the motor areas proper. Nevertheless, despite this possible freedom, its currents, through habit, are influenced to run over certain channels, to certain members and areas, which vary with persons and races.

The temporal muscle may be contracted to a degree without that we open the lips, yet when sight acts concomitantly with hearing the lips are parted, as in surprise. An overtaut temporal traction, however, betrays a glare and confusion of sight and caution on account of cerebral congestion. Restlessness of the muscle betrays a restlessness of the area. When the muscle is relaxed the eyes tend to become sightless and lusterless by that much. The area then suffers from anemia. The organism loses a certain physical tone with a resulting morbid feeling of depression. Psychically there is a sinking of spirits, a lack of self-defensiveness, melancholia. As far as mental interpretation is concerned in that direction, the eyes might as well not see; the printed page yields no meaning; the very flowers in one's path are not recognized—though in no wise because intellect is deranged. When there is a severe vaso-motor contraction in the area, the emotional phenomena partakes more of the nature of fear, the fear and terror of the ignorant child, which does not understand, or that fear induced by the darkness of night. In these negative, morbid, painful, emotional states, there is always present an interruption, a lowering of the nerve current that, if it continued to run smoothly, would produce the feeling of undaunted mental and moral well-being. These same interruptions and disruptions may also occur through idleness or overwork.

These depressions and blurs of insight that will not give way before ordinary appropriate stimulants, may yet dispel before bright and cheerful colors, prolonged sunlight and gladsome sights, even before imagination; or they may be overcome reflexively by the momentum of an intense general mental excitement; they are overcome by certain buoyant physical states. The hunger of a large area of Cautiousness produces discontent; its satisfaction is conducive to genius. The positive activity, whose origin is in light and physical satisfaction, of a large area creates that pronounced happy-go-lucky optimism of character which drew the attention of Gall to it. In other words, the area must not be too large or else an unusual dissatisfaction with environment and a desire to better it is necessary to arouse the practical innervation it yields. It is the connection of the area with our appreciation of beauty, and again its connection with gloominess, that gives beauty its touch of melancholy. Art is the child of a moderate melancholy. The blind are subject to a certain measure of sadness, and it required no little effort to bring about the optimism of Helen Kellar.

Absence of the area of caution naturally leaves the being with no capacity for that phase of fear of which it is the basis; with no heart for joy, no eye for beauty. The character of the narrow parietal head tends toward foolhardiness. The narrow head is that of isolated peoples and of those inhabiting vast plains, who exist comparatively unmolested and have no reason for emotional caution; whose view is a monotonous level, looked upon by the divergent eyes. As Ranke observed, it is the mountaineer peoples who by nature have broad heads. The broad head is the more practical, and of this practicality a normal caution is one of the factors. Consider the diversity and number of obstacles existent within even a *narrow* mountainous region, in its forms, color, sound and otherwise. It favors the skulking foe. Here it is not so much the nature of the food which determines the breadth of the cranium as it is the tension in which the masticatory muscles are held in the efforts put forth in the daily life. If at first the limbs came to the aid of the jaws, the jaws subsequently acted concomitantly, sympathetically, with the limbs as assistants. The broad head seeks a safe footing and inclines to be conservative, not to save energy, not because of laziness, but because of an impulse to do right. On the other hand, it happens that when the response is not to a diversity of stimuli, it takes the form of momentum, the basis of tyranny.

It is now apparent that many religious conversions, and others also, are made by a mechanical play upon the area of Cautiousness, and that they do not transform the entire psychic being, unless this effect is properly followed up by instruction. If the victim is disposed toward melancholy, the provoked helpless fear, induced by extreme representations, may drive him into a self-accusing insanity. When the opposite method is employed and the emotion is hinged to a single idea, it may bring about ecstasy and its fanaticism. The cold darkness of hades and the fire, smoke and horrors of hell both incapacitate mind, but in opposite ways, through circulatory effects; even as both excessive cold and excessive heat induce that sinking of vitality which brings about prolonged periods of sleep; while the buoyant assurance of the enjoyment of heavenly glory equally emasculates. According as the circulation rises and falls and the vaso-motor control varies in the area of cautiousness, so follow moments of fearlessness and fear, joy and sorrow, giving a person an apparent double character, since the area affects the rest of the brain by means of the association fibres. When permanent pressure and lesions take place the effect upon character is permanent, sometimes going to the worse. A derangement of Cautiousness, to ordinary observation especially, does not necessarily seriously manifest itself in the mind otherwise and may do so only in relation to certain subjects, or to certain states of body and mind. It is owing to the separateness of Cautiousness and Destructiveness that circumspect generals in battle, because of some gloomy foreboding, have suffered the most abject terror in moments of the greatest and undaunted destructive energy, and even of courage. It is often the case that the sympathetic cerebral influences appear slowly, as nausea does not make itself felt immediately upon our perception of a stench, and can be quickened or checked by a proper attention to the cranial muscles.

A characteristic sign of melancholy, which produces a very paralysis of motion, is the drooping jaw, anteriorly, showing that the emotional state of caution is sinking. Remembering that the area is abnormally affected either by a relaxation of its special muscle or by its undue tension, we perceive how the spreading jaws are consistent in the terrified bovine, and no less in man. The integumentary platysma, which possesses an influence of its own, likewise becomes involved when the area tends toward negativity. In moments of continued caution the tongue is apt to be protruded between the teeth and lips, a trick strikingly displayed by the gorilla gliding through the forest. In cautious anger the tongue is sometimes doubled between the incisors in order to increase the temporal muscular tension. This increase and decrease of muscular tension in the adult has its symbolic influence, if no other. Caution increases toward middle life coincidentally with the expanse and hardening of the muscles; in older age it declines again, with the thickening of the bones, the loss of the teeth and muscular enfeeblement, also with the weakening of its sense-organ and the bodily structure; for, we repeat, the cranial muscles are not the sole factors concerned.

A constructive area has been placed elsewhere in the brain, but with creatures that employ the mouth and bill cautiousness becomes an emotional support of the constructive center. In many cases this impulse is awakened to the point of greatest intensity only at those periods when vitality is at its best. When the male bird expends his joyousness in song, the female expends it in building a nest. The center probably furnishes some emotional coloring to the stealing propensity in all its phases. We are inclined to jerk the jaw when some object drops, and perform the same tactics when doing something we do not want another to become aware of—by it we actually sustain our own good feeling. A dog delights in running after objects and in seizing them with his mouth; he delights to bark, and the more he barks, the happier his disposition. The carnivores carry off their prey in triumphant attitudes. Felines delight in carrying off their young, and in these moments, when Cautiousness is thoroughly drawn upon, they exhibit wonderful powers for finding places of concealment. Their action is generally preceded by licking and fondling the young with the mouth, and it may be that Vigilance has more to do with their subsequent conduct than has Cautiousness. Many human beings conspicuously grit their incisors over children and other objects they exhibit a concern for. When female brutes devour their young it is generally immediately after giving them birth, when the energizing center of destructiveness, called upon in the act of parturition, is still potent and the occipital affective center and caution have not yet been aroused to a positive activity, a change in which a diffusion of circulation plays a part.

A person eating alone is usually a touching, sight and will draw a cheering or commiserating remark from a sympathetic heart, and for no other reason than that we expect the play of the temporal muscle to arouse the area of sight into more or less of a pleasurable state, enhanced by the absorption of nourishment. We prefer crisp foods to mushes because of the melancholy psychical effect the latter produce. In the same manner we seek foods that make us smack. To bring the circulation to the aid of the cranial muscles, stimulating drinks are universally resorted to at the festive board. Optimistic reflection, and mental intercourse, a cheerful table and beautiful surroundings will, however, accomplish the same end and without evil after-effects. When in war an enemy surprises a camp indulging in revelry, the victors of a moment before are liable to be stricken with fear and terror. In those cases caution has run to a fantastic excess, it has soared above reality and finds itself helpless for immediate serious purposes in the revulsion. The shock of the mental change, the cerebral contraction brought about by visions of terror, proves temporarily demoralizing, and the enemy takes advantage of this brief disablement the surprised ones inattentively permitted themselves to fall into.

Cautiousness,
    Temporal.
    Sight and light feeling.
    Joyousness—Melancholia.
    Neural and physical exhilaration.

BOOK IV.

THE CEREBELLUM.

Upon the very base of the occipital cup lies the cerebellum, a large free appendage of the central nervous tract. Its beginning is no doubt found in the head ganglion of the first creatures of any size and height of body that began locomotion independently of an organism balanced almost entirely by physical laws; for its function appears to be to yield that phase of sensation and induce that muscular tension which controls the physiological balancing of a body whose form partakes of much irregularity.

Although an independent mass from the cerebrum, the cerebellum lies in the same cavity with it, a bony partition sometimes intervening between them. Its location was determined by the muscles surrounding the cranial foramen posteriorly, since these necessarily came into strong play when the horizontal creature attempted to keep its normal posture, a posture to a certain point established by a long period of ancestral lethargetic life, and which could not well be changed without a corresponding transformation of the body and its functions. The size of the cerebellum thus naturally increased with the height of an animal, the length of its legs, posture, and the variety of its actions; muscle and brain center keeping so close together that it would appear almost impossible to say which preceded the other evolutionally.

But since the muscles retain some sensitiveness within themselves, and derive innervation from other sources, it is likely that they can, imperfectly and for brief spaces of time, imitate a new function cerebellarly unaided. The lateral and vertical parts of the cerebellum developed correspondingly to the horizontal or upright posture of the body and the direction of the principal movements of its members in a species. Fishes, though lacking limbs, have yet a great need for a mechanism to gauge the action of gravity upon their bodies, and the dizziness they must become subject to when drawn out of the support of the water is indeed sufficient cause for all their floundering.

Of all the forms of impressions the cerebellum takes note especially of pressure as produced by gravity within and upon the body, unconsciously and within infinitesimal limits of time and space. The functions of the cerebellum of the new-born child are few compared to the rest of the brain. Some changes of position do not impress it in the least, others most intensely, producing the so-called fear of falling. It has likewise become automatic, experiencing or inducing no mental fear, save indirectly under intense perturbance. It does its work of balancing automatically, energizing or relaxing the proper muscles, and without the necessity of watchfulness on the being. Its importance in brute life we may infer from its size there. It is small in the babe and large in creatures of unusual grace.

Sound acts upon the cerebellum through the semi-circular canals of the ear, spirit levels which also immediately give notice of the positions of the head not habitual, though their regulating influences never completely cease. This arrangement within the head is necessary where the mass of tissue is itself the last retreat of psychic perception and that has no means of knowing its position from any internal sensory source. Thus its position is measured by a material standard—on the plan of experimental psychology. If this inference is correct, it points to the necessity of keeping the brain in its proper position to call forth its best activity. Definite movements are also effected by the organism to counteract the impression of particular sounds. Noise, through its effect upon the fluids of the semi-circular canals, throws us into confusion, but musical sound is so delicately adjusted and its ventriloquistic effects are such that the easily accommodated movements result in the dance (Wundt).

Sight perturbs the cerebellum indirectly and suggestively. The movements of the eyes and their impressions must be considered among the direct effects, automatically going hand in hand with cerebellar activities. Sight, on account of the movement of the ocular muscles that measure distance, produces the impression of unbalance—and therefore arouses counteractive impulses in the cerebellum—when there is none; and under unusual surroundings when external factors and motions are looked upon as influencing the poise of the body and brain though they do not, or as more than they do.

The guardianship of the cerebellum, in maintaining the body in a general harmony with the force of gravitation, gives the cerebrum a remarkable independence to indulge in special movements. When the appendage is removed the creature no longer finds its organs controlled, a prop is knocked from under it. It then falls in any direction, as if intoxicated. In that predicament all other muscular tensions cannot be employed until they first establish a balance as far as they are capable. To do this requires a special cerebral effort and a draft upon consciousness and motory centers by that much. Injuries to particular parts of the cerebellar organ causes reelings in particular directions, staggerings, uncertain movements and perversions of organic functions. The mental disturbance is greatest when the semi-circular canals are damaged or thrown out of their proper planes. The consequent irregularity of the vaso-motor control produces quick successive and erratic interruptions of the mental currents.

Dizziness is closely conjoined with violent disturbances of equilibrium. It can be controlled by conscious muscular efforts, which tend to reduce the cerebellar turmoil and confusion and aid it to recover its throne. Dizziness can be brought about in many ways, but its primary cause is always the same. The weakness may lie in the tissue, or it may lie in the cerebellum, mayhap in recurrent influences from the cerebrum. In any case there is a conflict between gravity and the nervous energy striving to maintain the cells of the body in proper order, but the task is more difficult than that an unsteady nerve experiences in poising a ball upon the point of a sword. With the loss of equilibrium movements betray awkwardness. The internal disturbance—which gives the cerebellar activity a faint emotional tinge—goes so far that the stomach begins to reject all foreign substance it contains. The cerebellum may be involved by intense fear. Dizziness may set in through simple anemia. Color may play a part in producing sea-sickness, but the sea blue is not the entire cause, neither does it act through the eye alone in its chemical effects. The gravity disturbances in this case are produced both from without and from within the digestive canal.

The old swinging cradles, though well meant, exhausted the child by a mischievous play upon the cerebellum, as far as its influence was established, though a gentle hand greatly tempered this perturbing effect. It was the cause of much infantile feverishness and vomiting; and yet we must say that a rebellious child would develop a premature muscular control, and strengthen the vaso-motor and cerebellar power of the brain in resisting the shaking effects of the rocker; for in respect to the vaso-motor process, a mechanical jerk upon the body from without momentarily halts the current of blood, and in that instant sleep easily sets in—this also appears to be the principle on which the use of the cradle rests.

The upper surface of the cerebellum causes those backward movements which counteract the forward fall. Lying beneath the occipital lobes it is, after the appearance of these lobes, less subject to cranial muscular influence. But when the body begins to fall forward the cerebrum tends to recede from it, however slightly, and permits or induces the initial expansion. What is more, because the cerebellum is of comparatively early development, moreover, stable in its memories; it tends to automatonism. Thus it becomes largely independent of the cranial musculature, or substitute influences, even as the spinal cord does and as the cerebrum does, with certain limits. The base of the cerebellum also at present rests upon one of the least impressionable bony formations of the skull.

Cerebellum,
    Muscles surrounding foramen magnum.
    Muscular sense of gravity.
    Poise—Dizziness.
    Self-balancing.

MESIAL SURFACES OF THE HEMISPHERES.

To preserve brevity in this work we are compelled to omit many interesting topics and points, besides passing over many parts rapidly, and so likewise we shall make but a brief reference to the mesial surfaces of the cerebral hemispheres (Fig. 8)—regions included in the egoistic zone, and prominent enough to form a double convolution, broken though it is posteriorly.

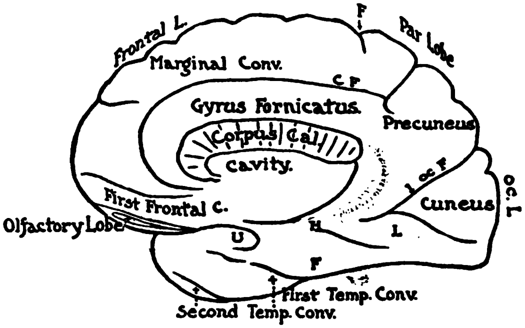

Fig. 8.

MESIAL VIEW OF BRAIN.

The base must be looked upon as inclining toward the horizontal. The cerebellum, which the posterior brain covers, is not represented.

C. F., Calloso-marginal fissure. I. OC. F., Internal occipital fissure. H, Subiculum. U, Uncinate C. F, Fusiform C. L, Lingual C.

These inner surfaces are at present subject to no muscular influence, unless it is a small one exerted by the muscular fibrils found in the covering of the cortex. Or they may be affected by the expansion and collapse of the *adjacent* areas. Primarily, however, before the surfaces were forced inward by the evagination of the central longitudinal border of the primitive vesicles, they lay partly in contact with the cranial shell. This would indicate that the functions of these areas at the core are of a very primordial origin and radical nature, relating to certain pristine needs of the brain-possessing creature; they are extremely automatic but not molarly motory. The gyrus fornicatus is undoubtedly, vitally, intellectually and emotionally more egoistical in its functions than is the marginal convolution. Such portions of the deep-seated sections as were not determined by muscular influences—by the separation of the plates at the longitudinal suture mayhap—and as are the seat of later acquired functions and memories, were yet determined so indirectly, in that they formed when the original area was active. The process is similar to that which takes place at the base of any lobe or lobule; it is a matter of diffusion of blood circulation and nerve energy. Moreover, the sensory currents, in comparison to the force of the cranial muscles, here exert the greater influence.

The marginal convolution, throughout its length, constitutes a part of the areas touching upon the cranial plates; it is under the dominance of the cranial muscles. Both convolutions are transversely divided up in a manner corresponding to the external vertical zones, and must be included in these zones.

Knowing this, the rest follows. The location of the deep-seated areas was determined by the cranial surface influences; at the top, however, more by associative currents. But now they are inherited and receive their stimulation almost completely from the sensory and other afferent currents which arise either inwardly or from nerves that serve the immediate needs of the body.

BOOK V.

THE EMOTIONS—SOCIAL

*EMOTION.

What are the emotions? In general terms, they are our experiences of pain or pleasure. The state of equanimity may be considered as one of pleasure; but intense pleasure runs into pain, whose origin is in a congested area. At the other, negative extreme, the subsidence or absence of pleasure is also the cause of pain. At the base emotions are appetites, supported by the least capacious and lowest phases of the sense-organs. But what is the emotional element in appetites? Are emotions precedent or consequent upon sense experience?

An appetite is a longing for something particular and objective for the satisfaction of self. It arises at once out of a need of the tissue and the presence of superabundant secretions. It is accompanied by a tissue sensation. Appetites are, therefore, inferior forms of emotion. Like all emotions they impel to action and give action zest; like them they are conjoined with a want. Whatever the craving is, when it is satisfied, when the physical or psychical self is invigorated to a certain point of balance, the emotions tend to subside into a state of equanimity; or they may yield their surplus energy for the establishment of new areas and the excitement and betterment of old ones.

***The Basis of Social Relations, by Brinton, might be of interest to many readers in this connection.**

An emotional area is negative when weak and anemic; when the cells are possessed of a weak charge. If a brain cell or area is for any reason contracted from its inner or outer sensory side, if its supply of blood is cut off by a vaso-motor interference, whether that is induced by imagination, hysteria or otherwise, the resulting state is one of physical and psychical revulsion from the object for which the tension is naturally felt, as in the case of a nausea for food. The cerebral enfeeblement is similar to that resulting from anemia or disease. It is similar to that which can be brought about by the withdrawal of its circulation to other unusually active areas, particularly to adjoining ones. The resulting states are those of pain, of dislike or hatred, and are intensified by the corresponding states of the cranial muscles; or when the areas are further enfeebled through being taxed by the activity of other cerebral centers, or the converse. Cerebral debilitation and repugnance or hatred are invariably conjoined. Things and persons we love in health, we are prone to reject with all else in sickness. Hence it is only when the emotional areas function at a normal that the feeling of pleasure results—even as the area of Destructiveness in equanimity produces a condition of physical pleasure. The strains involved with these revulsions are apt to be detrimental to self as well as to others, especially those connected with the very springs of vital existence; more or less injurious they always are. For one thing, they remove a certain amount of organic, consequently of psychic also, invigoration. It is equivalent to the removal of an area, and worse. The force substituted, as is the case when hate takes the place of love, is degenerative and destructive; it is not an addition to vitality.

Within certain limits, everything we experience a *moderate emotional* tension for, adds so much to our strength and endurance; it is in this fact that the power of emotion lies. Emotion perhaps always impels to action toward an object other than that for which it is felt, for the sake or possession of the latter, as when a knight undertook a task for his lady. When an emotional cell or area becomes emasculated, some other area must be substituted for it or else the extent as well as the variety of action is curtailed.

As we have said, the satisfaction of one emotion, whose substantiating structure is not exhausted, forms the basis for the appearance of a superior one, provided all the inferior tensions are also sated. The satiated cells do not cease to vibrate but they vibrate with less intensity while the objective element no longer so violently—painfully in the positive direction—appeals to the central point of the physical subject. The surcharged cells now transmit their energy about them; but down in the organism repletion tends to give birth to a new want or desire, joined to some new external object. A new current rises toward the cortex, guided to the proper area by the traction of the cranial muscles, and tends to imbue a new cell. You may reply that the current is guided by the pre-established nerve fibres, but at the root the cranial muscles determined the location of these. The object which caused the appearance of the new emotion will tend to become its stable object. The new objects, like the subjective stimulus, are generally, in the unpremeditated natural development, closely related to the old; as, when the interest broadens from self to others of the species and, after that, to other animals and things. The progress is apparently always from the known to the closely related unknown.

Emotions, however, are indeterminate, existing only as wholes. According to Meynert the areas of the posterior ones possess few connections with the brain ganglia. We do not know them except that they exist, fill us and move us; unless the intellect takes them up, as if they were externalities, for analysis. With all their strength, their potency for the induction of physical movement, why their vague effect upon consciousness? I think we may look for the answer on the side of the sensory elements. The subjective sensory stimuli by which the emotional centers are touched, in the main, are those undefined ones originating in the viscera and in the tissues of the body, and these display no particular nicety of distinguishment. Of how the sense-organs are concerned I have already spoken. In contrast to this, intellect is fed by the special sense-organs, whose source is without; their material is cold, not of the body of the self. But of all the senses sight, as it springs from the improved eye, in its more specialized forms, stands most distinctly aloof from emotion, and hearing next. Herein lies the explanation of the whole matter. The external objects are presented by the senses, and as more of the special sense material and that of intellect itself enters into the ascending regions of emotion, the feelings become correspondingly cooler. In the motory areas the incoming current spends itself again so quickly that emotion is hardly of any duration; furthermore, it spends itself upon its object, upon the bodily members. These, undoubtedly, in almost every imaginable case, have a subjective stimulus, but arising near and upon the periphery of the organism. It is because of the dominance of the internal stimuli that artists err who attempt to depict human emotion as dependent directly and only upon nature or upon externality in any form. But we lack the space to dilate further upon a subject whose full treatment would require volume upon volume.

CHAPTER I.

CARNALITY AND AMATIVENESS.

Carnality in the 1 Oc. C. Amativeness in the 2 Oc. C.

Carnality in the 1 Oc. C. Amativeness in the 2 Oc. C. The emotional areas at the base of the brain thus far considered, have to do principally and primarily with the maintenance of the body. Those of the occiput, which we now take up, have to do with interests arising from a surplus of energy and display an inclination for greater spontaneity of action; they tend to humanize. The brute occiput, as to length, with few exceptions, is of insignificant proportion, in many hardly reaching the anterior border of the cerebellum. The brutes exhibit no extensive objective *interests* purely, even as faint as those emotions yield, unless it is the regard for their own organism. Their sensory impressions, save those related to nourishment, tend to pass directly into motion, with little or no meditation of either intellect or emotion.

Wundt has defined emotion as feeling plus idea, but the ideas are not identical with those of intellect. It also varies with the cortical seat in the horizontal and vertical directions. Tempered by an element analogous to intellect, emotion is not an entirely blind organic and personal tension for some aspect of existence, and yet it is characteristically unanalytical and uncritical; its intellectual elements, though sufficient to recognize its object, are in a haze. The well-balanced occipital emotions evolve almost co-ordinately with the fore lobes of the brain, they depend, uncritically, upon the same degrees of evolution in the sense-organs; yet among civilized men, where abnormal individuals can manage to eke out their existence, the fore lobes, oftener than the occipital lobes, are largely developed, while the complementary posterior lobes are embryonic. Races capable of little personal and institutional attachments are marked by an occipital deficiency. Intellectual interests, especially, can go far and assume very attractive form in their stoicism without real social emotion entering into them. However brilliant, intellectual ideas, nevertheless, fail to appeal to and move a person in whom they take no emotional hold.

But emotion alone cannot go far, because of its narrowness of comprehension, that is, outside of the direct organic interest whose underlying cerebral centers and physical organs were firmly established previously by a long process of evolution and now act in an approximately correct and rigid automatic fashion; such is the emotion, or feeling, of vitativeness. Intellect is essential to place emotion upon a basis of freedom and to make its upper stages possible. At the same time emotion often goes far toward relieving an overburdened intellect.

The cervical cranial muscles affecting the posterior base of the occiput are the superficial ones; among them, the grand plexus and trapezius that, it will be observed, for instance, in the combats brutes wage against one another, when destruction of life for food is not the primary aim,—are employed in more or less unselfish efforts, for activity superfluous of brutish sustenance, or for psychic aims. They aid in lifting and holding the head to give its sense-organs a wider contemplative range; and it is at these moments that the emotions tend to come into play; they are intensified by the traction of the appropriate muscles in the waging of a combat.

The area in question extends as an arc between the self-defensive areas. The sensory currents entering Carnality and Amativeness are, as we shall see, undoubtedly, connected with the procreative states of the tissue; their sense-organs are the forms of touch, especially toward the median line. This is the region that unmistakably contains a motory nucleus for the pelvis. If hearing, and sight—as Munk observed—enter later, it can be only to modify touch where sexual selection is concerned. A few data may enlighten us further upon the organic bearing of the area. Persons having a long occipital base, though exhibiting a strong tenacity of life, are, nevertheless, very perceptive of organic sensations, as these are involved in emotion. The consequent complaining they constantly do, unless they heroically repress it, is not the result of sickness but of their acute sensibility. We are here upon a close relationship to Self-defensiveness, and, indeed, it will be recalled that the mastoidal muscles extend upon the occipital bone; while that area is also a lateral extension of that of Touch proper. The connection between the mastoidal and occipital regions becomes further evident in the commingling of their characteristic modes of defense; though the aims of the social emotions are distinct, as we shall see.

We find, in most of the lower animals at least, the principal weapon of offense and defense located upon the head, to be managed by the cervical muscles, which find their support on the posterior of the body, and thus arouse spinal centers co-ordinately.

The directions of muscular effort are few in the lower stratas of life, as the occipital functions are few and shallow, but in man, in whom the jaw falls into disuse, they are many and constant, the subjacent desposited brain area always corresponding in emotional function to the predominant interest preceding or tending to arise when the cranial muscle was and is most intensely active. It would seem, however, that under such violent conditions of origin there would arise a violent normal mind, but it is a fact, as we see in the case of the young, that the new born tissue is not immediately at its best; and if it is, it later subsides with the subsidence of the congestion of the area and bodily tissue to a normal condition, from which the various stages of pleasure and pain depart, and which determines the normal.

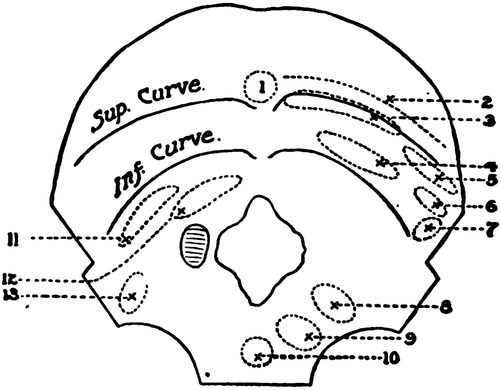

Fig. 9.

BASE OF OCCIPUT AND POINTS OF ATTACHMENT OF MUSCLES. (DIAG.)

1, Ligament nuchae. 2, Occipito-frontal. 3, Trapezius. 4, Grand complexus. 5, Mastoidal. 6, Splenius capitus. 7, Oblique superior. 8, Rectus capitus ant. minor. 9, R. cap. ant. major. 10, Sup. constrictor of pharynx. 11, R. cap. post. maj. 12, R. cap. post. min. 13, R. cap. lateral.

The simple creature, which never troubled itself by turning this way or that, simply pushed a way for itself in its advance, or surmounted the obstacles, organic or inorganic, in its path by the employment of the muscles lying along the median dorsal line. The anterio-posterior central zone, not excluding the mesial surface of the *brain,* accordingly represents egoistic psychisms from fore to back, for the self ever came first. The tension of the central cranial muscles in the activity we have just described, tended to draw backward the center of the occiput, and into the cavity thus formed gathered a new cerebral deposit which, motorily, reinforced the general muscular system concerned in the purely egoistic move. The energy, when not expended motorily, established the emotion, or tension, for certain egoistical aims, that at first are for subjective gratifications to be satisfied upon some objective form. Among these aims we might mention a yearning for sunshine, a yearning supported by a faint idea. A simple reflex would allow the organism to become lethargic until the sun came to it to warm it up.

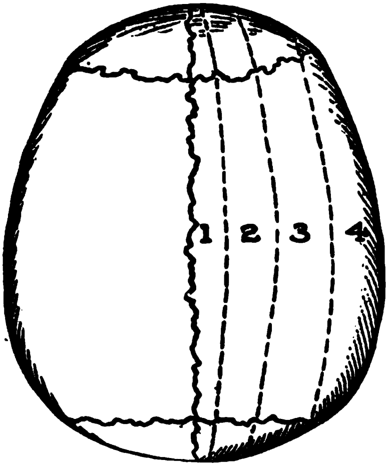

Fig. 10.

Posterior view of skull, showing approximate location of the longitudinal cortical zones. The plane which cuts off the pragmatic zone grazes the three cranial eminences, passing inward of the parietal.

1, Egoistic. 2, Altruistic. 3, Materialistic. 4, Pragmatic.

Chronologically these zones evolved from within outward, corresponding to the stages of mental interest manifested by the vertebrate animal.

As a simple interest in others tended to appear, proceeding from male to female, the creature—impelled to action by the interest— in clearing a path for its mate and self would draw upon the more lateral fibers of the cranial muscles and expand the occiput lateralward. Later the interests and activities would also go out toward offspring and other species, and, finally, in the material zone, toward inanimate and psychic matters—though the latter evolutions did not come into prominence until the occipital lobes attained considerable height—intensity of emotion arising out of the depth of a convoluted area. More so than Destructiveness, the occipital areas increase the body's vitality and energy. Upon these emotional tensions Mercier observes: "When a hunter is put out to grass it will break down, or surmount, almost any obstacle to get into another meadow in which other horses are. Put two or more animals of any kind on a common graze and they will always be found near together. So it is with man." He further shows how solitariness will reduce the flesh and strength of animals and how it will ruin a human being. The lack of interest in a task leaves us without the strength to undertake and accomplish it.

"Knowledge of all human hearts,
Sympathy for all the Arts,
How to die and how to live,
Love alone to me can give."

Of course, different persons display differences in this respect, according to the degree and part in which the occipital area is developed. There are those whose interests are completely material and in whom there is neither a feeling for self or for others; the lack of exercise of the full centers seriously perturbs them. To those deficient, the appropriate objects fail to appeal and they remain inert. It is the person or object toward which action is expended that is at the same time the external excitant of the area concerned; and though a center once developed subsides in a measure on account of disuse, it or its connections seem never to disappear completely, and remain capable of regeneration.

The heart of the various emotions lies between the sensory and motory current, at the point of arrest or when the current descends into the organism only. The motory innervation wrought by it can be variously modified before taking its ultimate effect. It may be expended in philosophic thought or in deed, the latter being purposeful or merely brutal assault and battery; and though many emotions have no intellectual representation, they yet add to the breadth of life. In any case the action is done and the energy completely expended for the object loved, as Destructiveness acts to obtain the food, for its possession, whether through attainment, defense, fostering or manufacture. If the cerebral fore lobes of an animal are removed, it becomes uglier in disposition than it formerly was. The emotional energy, boiling over, expends itself as a lower brutal force, emerging unrefined from lower cerebro-spinal muscles. The animal hangs its head and extends its back and limbs as if preparing to meet an antagonist with contracted sinews. The contraction occurs centrally, showing that there is a psychic depression (Münsterburg) and that a certain counteractive muscular tension has fallen away; that a forward moving nervous determinative current has been interrupted (Loeb).

On the other hand, when the occipital lobes are removed, all the phenomena are reversed. However, in the unmutilated being the backward fall of the head is then indicative of a dulling of the occipital lobes by an upper pressure. In health and in mutilation, when the fore lobes are pre-

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dominant, there appears a nonchalant buoyancy of spirit which exhibits no tendency for action. In this connection we may also gain a clew to the workings of the nervous currents in hypnotism.

While it is true that these emotions do not directly center in the maintenance of the organism, like those of destructiveness and vigilance, and are all-powerfully innervating, acting only under proper environment for the expenditure of surplus energy, all without adding bulky mass to the muscular system—their areas can to an extent be forced into machine-like activity. This is done in slavery and with domestic animals, but always the force that then can be called out is increased if the natural excitant is present, and the cranial muscles concerned are brought into play. Thus a measure of motory substitution takes place when once an area is established, in that the horse, instead of exerting himself for mate and young in the natural way, does it by enforced artificial work to save himself from abuse. Substitutions of attachments constantly take place; such are the various prostitutions and the perverted likings and loves.

Gall and Spurzheim located amativeness, the carnal phase of it, in the cerebellum, and if a weakness of the cerebellum weakens the organism, it probably also exerts an influence upon the spinal sexual center. The posterior surfaces of the occipital lobes are not under the control of the deeper-seated cervical muscles that steady the head and give location to the cerebellum. It is the outer circle of muscles that is connected with the sexual and personal emotion, as is plainly shown by the carriage of the head. Nor is it the cerebral emotion that impels to the sexual function; it but selects the object by a choice transcending a reflex.

To set the matter in a proper light and without quarrelling over the different theories evolutionists give of sexual propagation, we have but to remember that it is the organism overflowing with life in which the germ plasm of a new life generates. The occipital areas, concerned with physical personality in the median zone, being pre-eminently physical invigorators, without continually exhausting themselves in sustaining and providing for the body, and since their aim is objective, and thus they find satisfaction, it follows that they the oftener overflow with a surplus of energy, which then manifests itself in physical love, in emotion for the opposite sex, in psychical and platonic love, except in so far as the lateral ones are drawn upon to support the center; but this does not make the areas exclusively carnal or amative. This explanation accounts for the constant overflow of the sexual vitality resulting both from overfeeding and from periods of underwork, in beast and in man. Primordially the sexual instinct tended to come into play at certain seasons of the year when natural causes led to an overflow of vitality. An overflow of this kind would occur at the approach of the spring of the year from the energy gathered to overcome the severities of winter. Another factor which confirms the close connection of carnality with the base of the occipital brain is the relation emotional and physical sensitiveness and excitability bear to the sexual feeling. But the most important factor to which the topography of the brain points is that of a motory nucleus for the pelvis located here.[2]

Psychologists and moralists sometimes look upon hate as the reverse of love, and their position is nearer right than that of Ribot and of those who regard it as an intellectualized form of anger, though an intellectualized state it can be. If love is the emotional tension of the sex for sex of a kind—other emotional tensions being better expressed by the words "like" and "passion for," according to their intensity—its primary motory expression is within the organism climacterically at the principal point of sensory irritation; secondarily or preliminarily, its energy may be expended to attain, or for, the object—the state of more or less indifference resulting upon its satisfaction and exhaustion. But the predominant tension of one area sets others into the background; as, in the case of intellect, where we can take note of sound better in darkness, with closed eyes or in blindness. If love for self or for another now draws away the blood from an adjoining cerebral area, the anemic area is liable to turn from or upon its object with a feeling of revulsion, and it is this revulsion which underlies hatred, and yet the action is supported by the energy generated by a simultaneously active positive emotional area. The greater the devotion is for an object, the more intense are the repugnances liable to be against those which interfere with or are inimical to the passion; and against them it is that all the energy of the positive area is exerted motorily.

Sexual love and the hatred connected with it, is the more vehement in proportion as the procreative germplasm, or the cells concerned with it, are at the bursting-point. Diversion of love to aggressive hatred takes place through the appearance of some other motive. The surcharged areas find relief through a motory path within the brain or through the limbs. The pressure of both phases of an emotion tends to disappear with physical action, but if the energy remains seething in the brain, hatred is never done. Hatred is for this reason more characteristic of man than it is of the beast, though it first of all depends upon the existence of an amative area. Jealousy is an initial, modified form of hate and is especially characteristic of eunuchs, whose strongest nervous mechanism for social emotion and action has been maimed; they repel what naturally they would feel an attraction for. The antagonism, animosity and attack exhibited by animals, in whom the embryonic occipital areas lack depth and power, is not the hate of man, except cognately; they may be looked upon as mere reflexive acts of repulsion. Anger is aroused by hatred; but hate, if we wish to speak with exactness, is not a form of anger in its continuous form; it rises out of cerebral associative influences.

Primitively the creature feels no interest beyond its physical self, and that form of emotion in the narrowest phases is connected with reproductions direct from the self. When the occipital lobes gain in breadth, when the objects upon which action for the sake of emotion themselves become objects of emotion, we come upon the first step beyond self, and at that point begins the feeling of male and female of a species for each other, which later takes the form of the emotion of conjugality. The next emotion is for children and kin; after that, for material objects, which latter are long personified; and then energy is all expended in work and love is unsexed. The Kurdish head, for instance, lacks a depth of occipital interests. A miser, paradoxical as it may seem, stands at the farthest degree removed from selfish interests—he neglects the self for his pelf. With this broadening of the brain and emotional interests, the carriage and movements of the head vary more and more from the straightforward to the lateral, until they encroach upon self-defensiveness, into which they merge and where their significance changes.

The emotional interest in the young is first and pre-eminently evolved in the mother and sequently upon the lateral movements of the head put forth in the exercise of her care for them,—the size of the areas, here as everywhere, seemingly depending on the frequency of muscular movement rather than on intensity. She also originated, though she did not perfect, the industrial system, through emotional interests in its forms and pursuits, and she it was who transmitted the breadth of the occipital lobes to the race. The entire pragmatic region of the female brain, as a rule, is the thinner, Fig. 10. She is powerful in feeling, compared to man; she is lacking in a disposition to grab for self but, consequently also, in his range and endurance when it comes to the use of the limbs.

All vertebrates and the more naive human beings always make well-defined ducking movements of the head when working up energy for an attack and attainment whose aim is not destructive for the sake of food, but for the getting of desired objects of comfort. Birds do it. These movements are always so made that the cranial muscles draw upon the base of the occiput, lateralward, favoring lateral congestion and central anemia; a traction, moreover, which does not take place when the head is bowed in genuine grief, and, as it were, hangs on the long arm of the trapezine muscle and upon ligaments. The traction occurs when the body sustains a heavy load in front. It occurs when a small body puts forth a disproportionate amount of energy in doing physical labor a strong person would do with ease. The bowed head is therefore expressive of energy; it is resorted to by overworked men and women, by the old and feeble; at the same time it indicates a degree of suppression of the higher mental powers. The posture gives the expression of force to the hunch-back; it was that of the fearfully energetic Voltaire. Balancing a load upon the head, therefore, gives one the idea that the task is easily performed. Contrast the impression the carytides and atlantes make in comparison with an atlas.

Since the overflowing emotional inclinations of the base of the occiput in their moderate positive phase, when the energy is not diverted and otherwise used up, are of an amative nature and for living things, above all, for the species, and since they tend to personify inorganic things before displaying an interest in them, we may cling to the name of Amativeness for the upper division of the area, in the second occipital lobe; but apply the name Carnality to the inferior division, located in the horizontal cortical section of animality, Fig. 12. In its disordered condition the area exhibits various abnormal positive and negative extremes that the reader is now able to determine and recognize for himself. The median areas in a contracting state are, of course, necessarily present to give the feeling of misanthropy a foothold.

Carnality and Amativeness,
  Trapezius; grand complexus; mastoidal.
  Touch, dependent on cell saturation.
  Physical pleasure—Revulsion.
  Lower pelvic and general motory.

CHAPTER II.

AFFECTIVENESS.

Third occipital convolution.

Thus far we have considered only the first and second of the occipital lobes in any detail. The third lobe in part still lies within the squamosal addition of the occipital shell; the rest is covered by the posterior extremities of the parietal bones. Moreover, since the area also falls under the control of the occipito-frontal muscle, its function is subject to a triple modification from the cranio-muscular source. It is a case in which a muscle, neither temporal or occipital, grew after the area it brought into existence. Since the area is located in the ideal zone, its psychical nature is more pronounced than that of the lower lobe, out of the functions of which its functions evolved in direct ascending lines. At this stage, conjoined with the straightening of the legs into a line with the trunk, romantic elements, almost absent in the base, begin to make their appearance in all the central and lateral emotional phases to which we called attention. Affection takes the place of physical attraction, although this affection is still avowedly related to the loins. Here it is that a crude love for mate, child and thing first begins to be of any consequence. Here is undoubtedly the beginning of humanity. The egoistical emotion, transformed, still remains in the median anterio-posterior zone, a fact which forbids either the horizontal zone of conjugality or of philoprogenitiveness from extending *tending* unbroken completely across the occiput, as phrenology would have it. The area of friendship is located outwardly from either of the above emotions, and, like them, has a still farther vertical extension. It will be observed that the emotions in their carnal and amative phase are of a transient nature; they stand in close relation to the rise and fall of the organism, and pass away with the changes of the organism; as, for instance, with the growth of the young the evolution of the psychical nature brings into existence a factor for which amativeness in its peculiar way has no capacity of attraction and, consequently, of comprehension.

The superior occipital lobe, that for us shall constitute the area of affectiveness, formed when the victor had vanquished his antagonist or triumphed in his task—the deed was ever necessary for further cerebral evolution—and if his unexhausted energy was now directed to a conduct and tasks of a celebrative nature, and new. Egotistically the victory tended to fill him with a crude kind of elation, a feeling that becomes more abstract, sentimental and emphatic as we ascend the posterior cortical areas. In this triumphant state of mind the cranial muscles still remain taut, clearly by extension instead of contraction, and produce that carriage of the neck and head which accompanies the pride-like feeling in self, mate, child, fellows or property. All the attitudes described can be observed in the barnyard cock, either in the stiff-necked admiration of himself or in his supple-necked regard for his flock, and this solely in an automatic fashion, inclusive of the feeling; though the epicranial muscle, the state of that upon the forehead, also speaks in man. Since it was the victor that claimed the females, the cerebral additions would be transmitted, in the intensity of the organic condition of the moment, to some of the young, and the triumph of these again would slowly and gradually tend to improve the brain and animal as long as its organism remained plastic.

But the female transmitted her peculiar qualities in the same manner and thus each sex, going its own way, by a division of labor, yet improved the kind, and perhaps more quickly than if the pursuits of the sexes had been homogenous.

It is the upper occipital lobe in which experiments have revealed the closest relation to sight, and this connection gives us a clew to the more psychic character of its function as it appears in sexual selection; but the sensory side of the organism is not yet completely removed, although the tendency is to work for the sake of the emotion and not to exhaust the organism by a sensual expenditure of plasma. Sound appeals to amativeness in its various phases instantaneously when sight will often not. Sound is the principal signal of physical gregariousness, while it requires a considerable degree of psychical emotion before sight, in affection, takes social signs into account more comprehensively. Amativeness acts conjointly with perception, that grasps objects isolately. Affectiveness acts conjointly with a more advanced intellectual association, with Abception. Anteriorly of Affectiveness lies the area of cautiousness—as Vigilance lies before Amativeness, though farther removed—also pre-eminently dependent upon a phase of sight. Cautiousness acts upon a wider scope than vigilance, dependent on sound, and that manifests itself rather with selfishness, bigotry, clannishness. Affection is tempered by some caution.

We need not repeat ourselves by restating what we have said under Amativeness in order to make application of it, with its intenser psychical modifications, to Affectiveness. Since the feature language of Affectiveness is somewhat modified, we shall say a few words regarding that as it prevails in man, and though mayhap we encroach upon the next higher zone. The principal change which takes place is connected with the appearance of the epicranial, occipito-frontal, muscle, of which we shall have more to say in the next and succeeding chapters,—acting in conjunction with those concerned in the carriage of the head; a slight lifting of the occiput, an attitude which is immediately distinguishable from that produced by backward muscular tension in attack.

Like the basal emotion, affection is selfish and egotistic, or unselfish and altruistic. The selfish human female, however beautiful and intellectual she may be, is easily recognized by the neck devoid of the posterio-lateral movements; and what of these there appear are coarse. In the same manner we recognize sensuality, matronly love; or child love in its animal degree and of only a few years' duration, awakened in later years only when the offspring is in physical danger. We can divine the mass, shape, narrowness and breadth of the convolutions from the movements. How tender, delicate and infinite is the higher motherly love, represented in many of the best Madonnas in spite of their divine mission; often precociously marked in the maiden and in the little girl at her imaginary tasks. The attitude is depicted in the maiden of Dupre's picture "On the Prairie." It is portrayed in the "Charity" of Sarto. This cranial muscular play is represented faithfully in all the great works of art whose truthfulness men in general unconsciously recognize. It immortalized Greek sculpture. It is represented in the Niobe standing in a brave, courageous despair above the last surviving one of her children. It is represented in the Venus of Milo. But there is always, likewise, some interplay of the muscles governing distinct areas. When a victim succumbs to fate the trapezius, as if the last of the muscles to act in conjunction with the mastoidal, draws the head backward in a final spasm. This action is marked by a paternal care and self-defensiveness in the group of Laocoon. A head falling forward at the dying moment, suggests resignation. When the occipital muscles are extended to the last, the death is a proud or heroic one. It is evident that affection in the course of its evolution must reach a point when the enlarged number of its interests and its attachment for persons as well as for material things and place, compel it to resign a nomadic life; the attachment for place, neighborhood and country evolving as man's wanderings became more and more restricted, and, conversely, these institutions restrict his wanderings. This fact would give sufficient ground for designating a secondary area of inhabitiveness within that of Affectiveness; at the point where it appeared would be the beginning of a settled institutional life, agriculture and industry. Affectiveness extols the civilized hero; it delights in prowess. It creates the myths.

It needs no argument to show that while the same cerebral areas have a generical likeness of function in different creatures and persons, they are not alike as to detail, as to their particular interests and memories, because of variations in environment and experience and often because of organic composition and structure. They manifest a certain amount of plasticity even within one and the same person. As for the breadth of the skull being maintained in its rise, when abstraction eliminates the cruder details of experience, that is accounted for by the increased range of abstract material, but also by a widening of special interests. Contrarily, it is the depth of the skull at any point, in conjunction with the system of cerebral fissures, which gives a brain an increased capacity of retention for *the material* once in an area's possession. In other words, there are cerebral particles enough in the area so that each one does a single instead of a double or multiple service and thus acquires the quality of forgetfulness, amorphousness.

Affectiveness,
  Occipitals; temporal; occipito-frontal.
  Sight, and neural saturation.
  Pleasure in gregariousness—Solitariness.
  Upper pelvis, and leg tensions which bring the body into the upright posture.

CHAPTER III.

APPROBATIVENESS.

Lower part of Sup. Par. Lobe.

We shall call the next superior emotional area that of approbativeness, because its functions are distinctly those seeking support in institutional life; its objective sensory stimulus is from that; to that it seeks to conform, whether as it comes from the race or from the individual. Moreover, properly the area is located at the summit of the life-preservative zone. [3]Its motory nucleus, whose fibres go direct to the corpus striatum, is that of the legs, but it apparently innervates the extensory muscles only. It marks a naively joyous stage of life rather than of muscular contraction and hard work.

Approbativeness, colored by a conventional social tinge, lies beneath the parietal bones and for its creation is somewhat indebted to the temporal muscle. From this point upward the cerebral association fibers, however, begin to assert themselves with independent results. At the base of the brain the sub-areas were too few and the cerebral energy not associatively strong enough to bring about any results that could have expanded brain and mind and pushed the brain-pan upward or outward. Heretofore the brain acted only coincidently with certain sense impressions and muscular exertions of the organism, but now, when the energies run together, there results a new mental phase, a phase that could arise only with some muscular subsidence to permit the energies to expend themselves and elaborate within the cerebrum. The newly deposited areas, furthermore, grew out of those below, because they arose immediately subsequent to the excitement of a basal area and with a specific interest in the same classes of objects; and thus they also maintain an indirect muscular connection. These ascending zones, we shall discover, exist upon the entire round of the cortex, Fig. 12. Since the scalp is loosened and drawn tight for some distance beyond the point of insertion of a cranial muscle upon the skull, its influence is also extended in this manner.

Yet there is a muscle, exclusively cranial—which gains mobility with advance of mind in the animal scale—that in one of two or more ways directly influences, in a manner of its own, the upper region of the brain in all its parts. That is the occipito-frontal, extending from the upper rim of the occipital cup, over the affective area, to the frontal ridge above the eyes. This muscle probably also had much to do with preserving a certain evenness of the skull, since it or its apeneurosis would tend to compress any elevations out of the ordinary, and by relieving a hollow from pressure, favor its filling; though an absolute evenness does not favor the best constituted brain—some areas must overshadow others. To muscular suggestiveness the brain has already become dependent and habituated for its circulatory control, and it is through suggestion, as if laying a finger here or there upon the head to regulate vaso-motor activity, that the occipito-frontal muscle operates. The occipito-frontal may act conjointly with the basal muscles, as the vertical extension of the lower zones indicate, or it may act alone, as a whole, in part, or the fore or the back band contracts while the other relaxes. Its versatility is thus extensive, but its effects for cerebral ingestion are brought about by relaxation instead of contraction. Its contraction compresses an area.

The area of approbativeness, as we have said, also has a marked strain of preservation, of mastoidal source, superimposed upon it, over the longitudinal strands that predominate.

The approbative emotion may be right or it may be wrong, as regards an absolute standard. It is especially sensitive in sympathies either for the higher perceived self or for extrinsic persons and things in a semi-physical, semi-psychical manner. It is not yet wholly idealized, freed from the bounds of matter. Egoistically it manifests itself in self-esteem, a point at which self-approbation suffices. For the commendation it gives others there is no name in English that will compare with self-esteem. Love becomes still more romantic than heretofore, and platonic and, having some psychical basis, operates less exhaustively upon the organism, is more enduring; as hatred also is.

In the last analysis Approbativeness tends to remove from the carnal and animal stage and seeks the laws of reality, though these are still more or less disguised in persons and society—it does not fully know itself. It creates the society of custom, tradition and honor. It marks a transitional period from the mythologic ages, in which personalities and ways of doing concretely and wholly represent the law. It seeks teachers and leaders. The positive emotion, when lacking in a sufficient sensory substantiation, runs into an extreme and abnormal buoyancy throughout its breadth; into vanity, and then, of course, loses its bearings. Vanity exhibits itself in an undue admiration of trivial things. In the self it is not in the body as such that it is interested, but in the body plus the psychic self in that decking and in that status to which progress has lifted it; yet ever frivolous and foppishly—and ever seeking approval, as the emotion does in all its phases, forming a mixture of conceit and toadyism.

On the other hand, when the approbative zone is at the normal, there is a certain intellectual independence, providing the intellectual centers are present, and a manifestation of that emotional regard for personality, both in self and others, which adds so much to the dignity, beauty and poetry of life by eliminating slouchiness and cruder animality; that gives pride to persons and institutional life. That the end is accomplished emotionally does indeed not make it trustworthy; it is of no value except for personality in itself; and yet emotions finally become tolerably well adjusted to reality.

An emotion is certainly, in combination with its normal motory outlet, more than one degree elevated above sensation and its motory outcome.

The real and moderate emotion of the area under discussion is thus for a phase of truth objectified in a person or thing; for what is institutional. And it is for this reason that emotion nowhere else carries with it so approbative a tinge; nowhere else is the approval of man and authority so characteristically longed for and sought, nor human conventionality so domineering; nor so unsafe when unappreciated or hated. When approbativeness is active the reflected approval, representing the verification of the law, is a part of the person we feel for and act for.

In Affectiveness we observed a phase of mind to which the term inhabitiveness is applied by phrenologists. In Approbativeness we discern an accompanying phenomenon of mind to which the name concentration or continuity may be applied; the greater the psychical accomplishment, the greater must be attention. The phenomenon is, however, just as much present when the corresponding phase of intellect is operative, nor is it logically confined to this level of the brain, nor the most intense here. Continuity is nothing more than the enduring quality of the emotion;

than the attention of mind necessary for the mental operations and associative emotional and intellectual processes, which become rather difficult at this level of progress, to take place. It needs no mention that if emotion holds fast an object, intellect is the more likely to thoroughly examine it.

And, remarkable as it appears, an ordinary but isolated approbative area, because it lacks counterbalancing checks to its negative states, leads to a certain form of criminality of character. The area then lacks that balance afforded by the upper zones, and that afforded by amativeness and affectiveness. Its worst phase results from that irresponsibility present when the occipital lobes are rudimentary, for self-esteem and approval then run riot, are irrational and fix themselves upon and seek support for such ideals and things as are detrimental to organic stability. The rudimentary amativeness and affectiveness in these delinquents will express itself sophistically, basely, in primitive directions, in rough, reflex, animal sensuality and attachments. They seek approval for false ideals and find it,—always easy to do. Men and institutions they will hate and murder without compunction when their simple unstable, perverted emotions are not curried. Vanity is a noted characteristic of this class of criminals and so is physical weakness and obtuseness and superstition of feeling. Their minds do not faithfully respond to a certain stable element in reality—but, therewithal, we repeat, there are criminals from other causes than approbative emotional perversions and deficiencies.

The occipito-frontal muscle adds a new factor to the feature language of Approbativeness, over and above that of the extreme extension of the cervical muscles. When the occipital lobes are well developed throughout, the posterior attitude of approbativeness strikes one with a certain charm, especially when it is a woman who thus carries the prominent back of her head high; and for the reason that the presence of the area suggests a wealth of emotional depth for personality and all that is best in institutions and art. There is an illusive and deceptive charm added when the hair is also done up high. The hanging hair tends to add to the physical appeal, while the raised hair appeals magnetically, as we see it strikingly illustrated in the principal lady of Watteau's Embarkation for Cythera. The impression in either case cannot be produced when the back of the head runs up close behind the ears, when there is an absence of emotional volume and warmth.

Thus far the cranial muscles always have exerted an outward tension over the cerebral area in activity, but the temporal cannot operate here without involving its underlying area also. In this emergency the occipito-frontal muscle intervenes and accomplishes its suggestive effect in a manner reverse.

In ordinary things we know that even a slight cranial pressure by an external object makes itself felt on the brain and mind. The cranial muscles, no longer performing their primitive useful office, work the same suggestive effects, but we commonly take no more note of them consciously than we do of the respiratory muscles, and where they do produce pleasureable or painful mental effects, we attribute these to the wrong causes. The relaxation—which answers for tension at the base of the cranium—over the approbative area is accomplished by an upward extension of the frontal band and a slackening of the posterior band of the occipito-frontal; in a lesser degree, by a relaxation of only one of the bands. Upon the back of the head we cannot well note the operation, but the forehead generally speaks for it. There the approbative emotion is easily read in the lifted eyebrows and raised skin above them, the forehead remaining smooth. When the brows are lifted in the center, we know the feeling is egotistical; and we know that it becomes broader as they are lifted at the exterior ends, then producing the conventional expression of the devil whose interest is rather in material things than in the welfare of the self. When the brows are greatly elevated we may look for a large zone of approbativeness or an inordinate activity of it. In its extreme the expression reminds one of bigotry and arrogance. This was the expression upon Swedenborg's countenance; at the same time this mental attitude is the result of the superior being's emotional stand for a superior order of reality revealed to him, or searched out by him, backed by the approval of the gods, and upon which an inferior being is apt to look prejudicially. In simple vanity the same expression is less pronounced and stern and more vacillating; and in women, again, among such peoples as do not expect a serious strength of character from them, the expression is accepted as one of charm, going with the arched upper lip and upturned nose whose self-esteem is unshakable by any altruistic deficiencies in the personality of self. As the same expressions of the forehead also possess an intellectual significance, the reading of social emotion from it becomes rather a delicate task.

But now look at the coronoid process. It is the temporal fibers which run from this that bring an expansive traction upon Approbativeness, especially before the sutures close, and to bring a tension upon these fibres the normal chin must be thrust forward and downward. This gives the poetic chin, the chin indicating exactly the approbative characteristics of which we have spoken. Upon the wings of the approbative area, in the ideal strip of the spiritual zone, occupying the same relation Cautiousness does toward Affectiveness,—extends the area of conscientiousness, tempered by reason and that emotionally seeks knowledge and truth. This area represents the spiritual stage of self-preservative aspirations and is under the suggestive control of the epicranial muscles.

Approbativeness,
  Temporal; occipito-frontal.
  General sensation and conception.
  Pleasure in institutions—Anarchy.
  Leg extensions as concerned in producing erect posture.

BOOK VI.

PRAGMATIC EMOTIONS—INDUSTRIAL

SOME BRAIN DATA.

At a superficial glance it may appear that since the cranial muscles exercise the important influence they do, their weakening would enfeeble the mind, and senses also, correspondingly; and so it does, most markedly, as far as the basal areas, where they originally exert the greatest influence, are concerned; and the more so when the senses also give way from independent causes. But we have continually drawn attention to the fact that the more complicate cerebral associations, be they emotional, intellectual or even motory, demand underlying areas in every way protected against mechanical perturbations, except such as the cranial muscles and certain postures of the head exert to call them into action, these suggestive disturbances somewhat resembling those which cause chemical actions to take place; those which would impel a quiet water, standing unfrozen below the freezing-point, to congeal. Spatial quiescence is one of the foregoing favorable conditions; the superior convolutions also accordingly being superimposed, not upon bone, but upon other convolutions. Man no longer employs his head as a limb. In brain degeneration and mind sinking, the degeneration begins at the base of the brain nodules and convolutions; the summits, lying against the plates most influenced by muscular perturbances, and in which the earliest mental acquirements of life are innate, remaining intact longest and with them, their functions.

The matter has its bearing upon right-handedness in that the left hemispheres govern the right side of the body, the eyes and some other parts wholly or in part excepted. Practically we are either left-handed or right-handed throughout the length of the body, but the nervous system and the rest of the organism always standing in opposition to each other. Thus, when the cranial muscles or some of them of the left or right side, as the case may be, are weakened, the opposite, healthy, cerebral side is also affected. The upper part and intellectual part of the intact hemisphere suffers less, because less dependent on muscular influence, than its basal areas. It is the weaker perturbance that in paralysis, for a time at least, aids superior mental activity and adjustments, the intellect being still supported by the intact supersensitive opposite side. It is said that bidextrous children are of inferior intelligence, a fact that suggests animal bidexterity. However, the inferiority is not absolute; bidexterity, psychical and physical, is harder to acquire and undoubtedly lengthens life. Persons of strong muscles, nevertheless, despite unilateral habits, are mentally inferior. It may then be that physically the innervations of the more primitive character take place upon the left side, but that, as regards intellect, they occur upon the right side, as Delauney's investigations upon conscious dreams seem to prove. It is even possible that the cruder and original movements owe their innervation to the right hemispheres, acted upon by the stronger muscles in right-handedness, the direction of least resistance, and the more skillful and later acquired owe it to the left, for be it remembered that an infant is bidextrous.

In the above conditions the more developed intellectual areas encroach somewhat into the space left behind them by the areas which do not come into an intense erethism. Moreover, the weaker functioning posterior regions, simply conveying the sensory currents normally, would be less apt to perturb the thinking process. The factor of time is always necessary for thought, and in the time consumed the opposite hemisphere could amply be drawn upon for information and reinforcement, if it is not otherwise employed. The same argument applies to the motory and emotional regions. If a difference of functioning of the two hemispheres is no longer introspectively perceptible to the adult, except in pathological affections, that is not stranger than the case of the olfactory lobes or that of the eyes whose two images are fused into one for the ordinary person, and which are usually of quite different degrees of strength.

Anatomical measurements of the two sides of the skull and brain have not yet been carried to a sufficiently delicate extreme to be of use on the above points, but it is known that the right front half and the left posterior half of the skull are the longer. As a compensating poise called forth by the muscles employed in right-handedness, the left cervical muscles are put to a strain and they would tend to enlarge the corresponding occipital region. In respect to the enlargement of the frontal intellectual region, that is due in part to the action of the muscles of mastication and lower animal muscles and in part to anatomical expansion regulated by the epicranial muscles. Here the predominant external sensory influence is derived principally from the eyes.

CHAPTER I.

PREHENSIVENESS.

Lower portion of ascending Par. lobe.

We have now completed our study of the hind portion of the hemispheres, the social and moral divisions, although these were chronologically not the first of the centers of the primitive vesicles to expand to magnified proportions. We also found them to be pre-eminently emotional areas, in that their received and elaborated sensory impression, except for the presence of small motory nuclei in them, does not pass out of them immediately into a motory impulse—and thus leaving a blank neural state similar to that in the centers of the spinal cord—they are sustained, the quality which makes culture possible. The emotional areas may discharge immediately upon receiving a stimulus but, as a rule, they do not do so, and their reserve vibrating power creates the emotional states whose peripheral discharges serve as enormous reinforcing energizers in action or in mental operations.

The area we now take up is that of the anterior portion of the ascending limb of the upper parietal arch. The center, which must be considered as a diverging limb of the mouth area, governs manual acquisitiveness and we shall apply the term Prehensiveness to it, for at the base it conveys more of an objective significance; it is the representative, primitive, area of the prehensive zone.

Anatomically this region of the cortex lies close to the corpus striatum, the ganglion through which all the motory impulses, those of the mouth region innervating the cranial muscle that determined its location, arising within the sheath of the cerebrum gather before passing out into spinal cord and organism. It likewise lies in close proximity to the optic thalmus, into which all the sensory fibres gather before spreading through the cortex. Its position, therefore, facilitates the prompt reception of sensory impressions and their prompt discharge; the impulses from the emotional and other distantly placed areas, it is plain, must move against the greater resistance. The character of the function of Prehensiveness, therefore, approaches that of the spinal tract; the currents pass into it and out again promptly, frequently and conspicuously in daily life, the only reason for applying the term motory to them. Moreover, owing to the constancy and frequency with which the function is repeated in using the mouth or hand, it and its connections have become vividly and indelibly fixed in the brain cells or particles; as also its motory members assume definite shape. These brain cells do not hesitate because of any uncertainty in respect to their office when a stimulus, to which they are adapted in a fixed manner, comes in. In no part of the cortex does the function come so near being instinctive and inherited. If, therefore, the area pathologically becomes separated from the rest of the cortex, the uncontrollable manner of action is strikingly mechanical, exhibiting no such display of emotion and organic commotion as the mania of Destructiveness does or like the crazed love of Amativeness—the emotional phase is almost eliminated—and if Prehensiveness is capable of any emotion at present it is for its particular movements themselves and not for an external object—it being indifferent to the object acted upon. It is to relieve itself from this longing pressure that it acts, its impulse being supplementary and an addition to that of the spinal center in the lower cervical region.

To understand the origin of the location of Prehension it is necessary to bear in mind the imperativeness of its presence at the time of its appearance adjoining the cerebral ganglia; its movements occupied the role of the fittest in the aid of the creature's mouth efforts for existence. We should perhaps have considered the mouth region first, and separately, but all it is necessary for us to know at present is that that area lies next below, immediately above the temporal lobes, as we might conjecture, and that it was the fore-limbs coming to the aid of the prehensive mouth-organs, after the antecedent improvement of these, which necessitated the new center. This and other motory areas are governed by the temporal muscle and, undoubtedly, by the earliest and most effective fibres of that muscle which fixed themselves to the temporal plate. They would at the same time be those to act upon the plate most effectively and constantly, since the triturating movements are many times more numerous than those grasping the prey or food of any kind; moreover, the temporal muscle acts in conjunction with the masseter. In man the movements of the hands have come to take precedence of those of the mouth—in infancy the manual movements are acquired with the concomitant action of the jaw, thus indicating the priority of the appearance of the jaw center. In later years, when we strive to do a task with special accuracy, especially is this the case with the unskilled, we are still prone to make concomitant, seemingly useless, movements of the mouth, as if to make cranial room for one or two additional cerebral particles in order to attain skill.

Prehensiveness, upon the extensive development of the *brain, also* receives its impulses from within and upper mental sources. If it was once priorily served by one of the senses, by touch, taste or smell, it is later served by all; and incoming currents that are at the moment diverted from it into the cortex for transformation, subsequently return, mayhap at a more appropriate moment for action. Other centers do its storage work, discriminate for it; do its emotional and intellectual work; yield the being the power of voluntary and spontaneous action. Kleptomania develops when there is no control from the direction of the intellect and emotions. In the absence of superior control, there is an emotional tension for this or that movement; the movement will impulsively take place, whilst the intellect knows nothing of the whole proceeding and therefore is unable to control it; nor do we know of it by feeling, for none takes place. A more demoralized form of prehensive activity is that which is severed, permanently or periodically, from all mental control. Any abnormalities in the tissue of the area are promptly manifested outwardly, in laziness, overactivity or otherwise; in repugnance for action when the cells are exhausted or anemic. A large area, when healthy, proves of advantage to the owner as a powerful innervating center into many directions; it favors either momentum or skill, according as the peripheral physical members are developed. It is a superior dynamic reinforcement, because two cells are better than one, and one need never become nutritionally exhausted by being pressed in multiple kinds of innervation in order to effect different movements, for the attainment of which there exist no specific cells because of a paucity of number. Again the active cell draws upon the energy of the non-active.

Prehensiveness is indeed, as writers have said, conjoined with the getting of wealth and property, but in an indirect manner. It has just as much to do with the acquirement of musical or other attainments. It exercises a control of the jaws and fore limbs and that only, doing this in different ways in different creatures, according to the structure, habits, and environment of these. As Spurzheim observed, the limbs of one animal would be of no use to another. A man can substitute an iron hook for a lost hand, but of what use would a human hand be to a dog? The special adaptations of brain to limb were, of course, brought about by a process of natural development and education; these processes establish the character of sensitiveness, the structure and its joining fibres. In most cases the parts concerned in the action do not come to maturity until some time after birth. Now the reason why a large Prehensiveness is also likely to be indicative of property acquisition is because, under the prevailing social order, that is the direction in which the average man exerts his prehensive manual efforts, the motive coming from an intellectual, or from an emotional region where lurks the attachment for the objects longed for and hoarded. Yet an exuberant, purposeless activity does not show acquisition. A pure kleptomania exhibits no desire, necessarily, for the objects taken; it appears often to be the result of a tension for activity, especially of the hand. This same explanation applies to the lower creatures, in whom a certain stimulus is generally necessary to set the jaws and fore-limbs to work, and narrows the round of action. A squirrel will respond to nuts. Naturally the hoarding propensity and activity developed with respect to the surplus objects taken for food or other utilitarian purposes.

Because of physical limitations the possible hand and arm movements finally come to an end and another area develops above their border, no doubt to come to their assistance as they come to the assistance of the jaws; the old areas having to expand by increase of depth thereafter. This point of arrest may be such a one, however, that nonpluses the entire organism in its best efforts to evolve and overcome the obstacles, and the resultant state of mind would remain an emotional yearning for greater things, kept alive by the continual existence of the stimuli; it would remain as idea. To take an extreme illustration, the object might be the moon. There would then exist an emotional state to which the term sublimity can be applied. Such an area does exist and it forms part of Prehensiveness. The active members, the limbs of imagination, are now a part of the cortex itself. This subdivision of Prehensiveness lies within the physical ideal zone, upon a level with Approbativeness and Cautiousness.

Emotions of sublimity are connected with objects and abstractions upon which they can never vent themselves motorily, and are of immense energizing value in that manner, for they lead toward the unknown knowable. In time they may attain their end by inventive devices. It is a sort of dream stage of mind, grasping for phantoms, and yet it is likewise the creative state necessary for institutional progress. Since usually nothing external in nature corresponds to the ideal arising from the mind, the center, moreover, in part depends upon the intellectual region of imagination for what answers to the external sensory stimulus.

In the upper prehensive areas, especially in that of Veracity, in the realm of knowledge, where mind is again able to deal with substantial material, the morbid motory expressions also change. The stigma affixed to kleptomania ought not to be that affixed to thieving and robbing only, and yet the principle of property and the morbid attachment for it, that the majority condone in one another, blinds the mind to the real issue. As I have said before, the active lower areas are incapable of higher association and insight. In the psychical realm where thoughts are freely stolen, what corresponds to stealing is not considered immoral but is, rather, praiseworthy. Indeed it is considered the duty of all to seek after more knowledge and truth; though at a certain crude stage of development much is made of plagiarism, which is well enough if an author is compelled to eke out an existence by the right to his compositions.

The cranial manifestations of Prehensiveness are not often made an object of art, for the hairy portion of the head has hitherto not been employed purposely to express the mind, even as the Greeks, in their time, did not employ the expression of countenance in its psychical delicacy. Nevertheless the best Greek statuary shows a good parietal breadth of the middle and upper head when the active character portrayed demands it; and that people as a whole was active, and not in sports alone. They knew what shape to give to the heads of satyrs and bacchantes, to heroes, philosophers, and to the gods. A certain breadth of the head is essential for the establishment of a beautiful hand and form; to give these life, adjustment, skill and magnetic power.

Upon the face the expression comes through the temporal muscle. A weak lower jaw would indicate an indisposition to use the mouth and hands, besides it would indicate a weakness of sublimity in feeling, of conscientiousness; of Volition, discussed in a separate chapter. When there is a strong inclination to use the hands, the forward teeth are apt to be set, as in gritting them in the absence of an object to bite. Likewise the distention of the jaws is resorted to to bring about the vertical traction of the temporal muscle, though the hanging jaw and open mouth is, contrarily, a sign of a lack of will and manual readiness. Millet's Man with the Hoe is a delinquent by physical construction. In the works of the Greeks the conjoint action of hands and mouth is generally shown. It is finely done in the group of Laocoon. Such expressions may appear coarse, but they are in keeping with and imperative for the mental areas that are supremely active in a violent or death struggle. The concomitant action of mouth and hands comes forth spontaneously in playing singers, but in the use of the wind instruments the breath and jaw movements are applied to the instrument. The most difficult and latest music to develop is that in which the jaw movements are suppressed concurrently with many sensuous psychical elements, for it must be done by force of will to acquire a consummate skill in the subsequent areas and substituted limbs.

Prehensiveness,
  Temporal.
  Touch; appetites and desires.
  Neutral inclination for oral and manual activity—
    Oral and manual inactivity.
  Mouth, hand and arm contractions.

CHAPTER II.

CONSTRUCTIVENESS.

Lower portion of ascending Fr. lobe.

In man the myriad of additions made to the fore limbs are astonishing; those made to the mouth no less so, but the cerebral areas which evolved to support these have undergone a complete reversion of original function in the case of speech. The mouth area, which includes the lips and upper part of the throat, runs along the operculum, above the fissure of Sylvius, and out of the base of the ascending limb of the upper parietal arch, forward into the first frontal lobe. The small area at the base of the parietal limb, whose function belongs to Prehensiveness, regulates but few movements, reinforcingly innervating the masseter and temporal among other muscles. The movements have nothing to do, save mediately, with the enjoyment of food, and if they alone act, exclusive of sensation and emotion, we possess no feeling or knowledge whatever of taking or having taken food. Hence there is such a pathologic condition as a biting mania.

The next advanced mouth section lies at the base of the ascending frontal lobe, including a semi-intellectual function which goes out into movements of motory construction. To the area in which it lies, extending from the sylvian fissure, perhaps better from the central line of the base of the brain, to the top of the head, to the corpus callosum, and bounded behind by the central fissure, but slightly crossing the coronal suture and precentral fissure in front, we shall apply the name of Constructiveness. It arose with the primary formation of the fore-brain, back of which it lies, which long remained in a rudimentary state. In the mouth region the advance in function was such as we observe in the rodents, or in a person holding the pipe in smoking. Constructiveness requires an element of mental study; its movements, for it is a motory center, are an improvement upon those arising posteriorly. The latter tend merely to grasp and to hold; the former, by an innervation, especially of the extensors, put the objects attained to some use, arranging and placing them into combinations. These objects are a surplus of the stock gathered by Prehensiveness, for which, in the back of the brain, there develops, however limited and slight at first, an emotional feeling, and in the fore part, an intellectual analysis and synthesis. When a rat gnaws a hole into a wall, which it does not begin before first studying the situation, this explanation does not seem to apply; but this habit of the rat, a combination of prehensile and constructive movements, is already an advance upon the first instinct. Nor, again, does a creature operate upon the surplus store of food only. A squirrel must gnaw upon a tree in building a storehouse for its food, an intricate undertaking the primitive squirrel did not attempt—it had not developed the storage instinct. Later these constructive movements were employed to make a comfortable resting-place for the body in a nest, lair, burrow, house, industrial system, thought systems.

The motory responses of Constructiveness are not so closely reflex as those of Prehensiveness. Like those of any area their particular character, their content, is not dependent upon the cranial muscle but is determined by the exciting impressions, by environment out of which habits grow. The homologous areas in the different animals are therefore simple, complex, or, in man, composite. The ways of the different species of rodents are not alike, nor are the habits of the different individuals of the same species.

The mouth area being originally confined to a narrow space, and further restrained by the gathering fibres of the temporal muscle, posteriorly at least, in its unforeseen subsequent development was forced to make room for itself by an increase of depth inward and thus contributed to an extraordinary formation, the Sylvian cleft. However, these remarks must not blind us to the fact that the area is dependent upon a cranial muscle and that it could not exist in its strength at the top or in the front part of the skull, vertebrates being formed as they are. The cruder movements of the mouth, like those of the hand in its place, constitute the core of Constructiveness and of Prehensiveness; the same movements enter into the kleptomania and into the work of a genius. Since the area of speech, forming the convolution of Broca, lies back of the pre-central fissure though partly inside of the frontal shell, and is included with the ascending frontal lobe of this work, we shall say a few words in regard to that area here. It is hardly necessary to repeat that it was this area in which experiment and medical observation came to the first definite results. The function of the speech area is constructive; through an infinite variety of muscular combinations it produces, by its discharges, the nice and intricate movements of the mouth necessary for speech. It is under the suggestive control of the temporal muscle—but since it works upon air and the organism itself, it reaches the object appealed to in that manner. The evagination formed by the speech area is also enormous and tends to be marked with numerous sulci.

The mouth area of construction merges into another manual area. The co-ordinate action of the extensors with the flexors now makes the constructive capacity of the hands easy and infinite; it marks the decided advance of civilization and art.

Like Prehensiveness, Constructiveness also, on account of the finite bodily members, reaches a gulf it cannot bridge, save in thought. Hence the sub-areas of ideality, and of optimistic construction, where the mind would if the body could; optimism, where knowledge is the material, and that can transcend all limitations by virtue of imagination. The state of mind is still emotional, its tension being for the idea dimly perceived. The material is now ideal. Sublimity, on the same level, feels for and aspires for the grandeur of reality; ideality feels for and constructs a grandeur out of the elements of Sublimity, resembling but lacking the exactness of geometrical and mathematical constructions. Ideality, in its expansion, not only aims at grandeur but at constructive perfection and beauty, in giving form to which it is never entirely successful.

Ideality toward the material longitudinal zone ascends into a still more abstract phase, into the psychical ideal zone, that of Optimism, where it concerns itself with the material of higher thought and reason, with principles and energies, though, mayhap, personifying these; coming close enough to the absolute to cause marveling and speculation. Its conflict with reality decreases, what though it may exhibit spiritual, mythologic tendencies. A spiritual mind, one with an active constructive abstract area, is consequently a hopeful mind, and that whether it posits an immortal soul, which will some time freely enjoy its constructed ideal realm of beauty, or not. Inwardly, at least, it constructs a world in which all is well, and that a spirit might enjoy. A full respiration is its essential physical concomitant. Yet it behooves us to perceive the proper connections and relations, and remember that a tinge of hope runs through all ideal areas.

Strong, erect shoulders are always essential to give the body a buoyant appearance of hopefulness; they show, anatomically, that the lungs are not cramped, the vital processes hampered and incapable of supporting the higher psychical functions. There is no good religious picture or statue possessing weak and sloping shoulders. The peasant and workman always seems the less wearied by the day's work and the arduousness of the task in proportion as he or she employs the shoulders, and thus develops them and opens the upper cavity of the lungs; for in his indulgence in higher mental process he becomes oblivious of physical drudgery. To the dog his master is truly a most marvelous being;? and if he develops an emotional tail area in the upper part of the ascending frontal convolution, there is nothing miraculous in that. In fact, however, the action of the tail is concomitant.

In its upper region Constructiveness is, accordingly, picturesquely imaginative, having a feeling and tension for the picturesque, as spiritualists have for spirits. It reaches its climax of interest in the realm of ultimate things and causes, in the area located at the top and central line of the brain; but we shall leave the discussion of this divination and its function for a separate chapter, for in that discussion we shall plow a wide furrow through the field of orthodox religion.

The anterior strip of Constructiveness lies beneath the coronal border of the frontal bone, within the posterior border of the first frontal convolution. To the speech center we referred in the course of the chapter. The motory reactions which have been obtained directly above the speech center in front of the fissure are indefinite but, as we might expect, they are of the head and eyes. The application to be made is simple; these head movements are those which necessarily accompany the constructive operations of the jaws and fore limbs, to guide them to the point of application and to guide the eyes in the necessary observation and accompanying operations of intellect.

Into the featural expression of Constructiveness we shall not go far. The upper portion of the zone lies beneath the apeneurosis of the occipito-frontal muscle and its states can be detected by a shrewd observation of this muscle. A normal ideality and optimism expresses itself upon the lateral parts of a smooth, almost joyous forehead. The eyes, with dilated pupils, are somewhat turned upwardly in a modification of the traditional expression of hopefulness, which is not artificial, and presents one example where, in a matter touching upon life, our forebears were not ignoramuses.

The fibres of the temporal muscle attached to area of Constructiveness run forwardly from the coronoid process. A forced tension is therefore brought upon the cranial plates by drawing the back of the jaw, with or without a relaxation of the masseter, downward, the angle moving forward and the chin forward and upward; modifications of these movements entering whenever an area which the anterior fibres of the temporal touch is concerned. To produce this tension in the opposite direction and also apply the necessary force to the incisors, the lower jaws of the most inveterate of the rodents have degenerated in size. Here again it is evident that in the interest of the intellectual operations toward the fore part of the head, the prognathous jaw and its musculature must degenerate and transform.

Constructiveness,
  Temporal and masseter.
  Objective sensations, and yearnings for readjustment of material.
  Counterbalancing mouth, hand and arm tensions—Torpor.
  Mouth, hand and arm contractions + extensions.

CHAPTER III.

LANGUAGE.

Ant. part of base of ascending Fr. lobe. Fig. 6.

Before taking up the intellective portion of the frontal lobes of the hemispheres, we shall revert to the language area to complete our investigation there. The physical movements produced in the forward part of the mouth in speaking, and their adjustment, which requires an exceedingly delicate cerebral innervating center, makes the location of that center within the frontal shell almost imperative; it is not there accidentally. The slightest variation in the combinations of speech movements that produce words and sentences with their intonations is not permissible, even in dialects. For the sensory innervation of higher language a musical sort must be presupposed to regulate intonation and other musical qualities. With the manual area, which may be employed in language; with the sight area as involved in reading and interpretation, the mouth areas are related associatively.

The language area had its beginning in the posterior part of the mouth region, in the prehensive zone, where its products were of a low emotional order as impelled by the existent areas and structures. Spoken language is understood through the medium of Vigilance, the traits of suspicion manifested by that area vanishing with its heightened capacity and use. And, paradoxical as it may seem, the language area receives its prime sensory impulse from the thought region. Words produce no originality of thought, no matter how many of them we shake together; thought advance is but indirectly dependent upon language. Ordinarily, when language has become established, or in the case of the child, the word precedes the thought, and the talk of many people, poor imitators, is never much more than empty words. It is this backward flow of the current in imitation, either from the ear or from the muscles of speech, from the seen word itself, that has caused wise men to argue that speech precedes thought. Thought vivifies itself with words, uses them as its tangible representatives, and so rapidly that a superficial introspection is easily deceived, but when the physiological process is traced the wings of fancy are quickly clipped.

The cranial muscular influence upon the language area comes from certain anterior fibres of the temporal muscle. The progress of language has been forward in the mouth, from the gutteral sounds produced farther back, in the operculum, to sounds produced more anteriorly, so that the cranial muscle and the language muscles operate reciprocally and in harmony. If finer muscular adjustments also take place in the throat, these seem to be regulated from the supple neck region, and by those muscles which run along the base of the mouth to the throat and hyoid bone. A particular permanent carriage or formation of the jaw-bone, conjoined with an inordinate activity of the temporal muscular fibres stimulating it, accordingly, has much to do in establishing babblomania or, on the other hand, an inert cerebral center.

The language area, as it concerns the later movements essential for speech, we have seen, lies within the zone of Constructiveness, and in front of the manual area. It is, therefore, not strange when primitively, before this oral center was evolved, we find gesture language occurring in connection with grunts. If at one stage of evolution the *limbs came* to the relief of the mouth, the mouth now again comes to the relief of the limbs. The part spoken language plays in human life can be seen in making a comparison of the volume of Broca's convolution with the homologous region in the brutes. Its size causes a double fissure besides those minor fissures formed upon the inner face of the fold the cortex here makes. The island of Reil is undoubtedly concerned with speech. From the primitive simplicity of its function, when a few and then a few hundred words serve a people, we can also conjecture the analogous humble start other areas had.

The sign of a good capacity for language was placed in the prominent eye by that shrewd observer Gall. The eyes are especially prominent in conversation, a position brought about by the retraction of the lavater muscle. The same prominence, though with less play at any instant, is characteristic of perception, and language, particularly that of conversation, uses the terms of perception—is picturesque; that of philosophy is less so, and the philosophical eye tends to be retreating, substantiating the assertion that thought does not ride in upon words or burden itself with a profusion of them. For some of our highest insights we do not even find symbols. Thought in its highest form employs a simpler symbolism of its own, a silent one; it neglects both the mouth and manual areas. If the eye muscles do not have a direct suggestive cranial effect upon the language area, which lies upon the orbital surface, and touches upon the sphenoidal plate to which the muscles are attached, the forward projection of the eye-ball must have such an effect through the removal of pressure or tension from the roof of the orbit. The bulging inward of the orbit is no less impossible than expansion in an outward direction.

Anteriorly of the constructive area pronounced motory responses abruptly cease, but if we could produce them by the application of the proper stimulus, we would obtain associative thought, which, when of a routine character and pressed hard enough, would vent itself in appropriate speech or action, whose automatonism is hidden by its intricacy. Yet we do not wish to be understood as saying that intellect operates without a more or less extent of freedom in its automatonism.

Language,
  Temporal.
  Intellectual currents.
  Pleasure in oral activity—Lingual inertness.
  Complicate mouth movements.

BOOK VII.

INTELLECT—PREHENSIVE

NUMBER AND CALCULATION.

First frontal lobe.

Forward of Language we enter the center of Number and that of Calculation, located in the prehensive zone of intellect, in which there appears only a consciousness of results, while the process is with difficulty followed. Its material, though based upon the concrete, is abstract, those abstract constants, representations of reality, which the mind is compelled to hold before itself to attain results in the absence of objects themselves. This prehended mental stuff must therefore be a faithful copy of reality, but it is not dealt with for the discovery of cause and effect. The aim is simply to learn things and their mathematical relations, and to apply these again to reality. To what extent these abstracts can be dealt with calculatively, is forcibly shown in the different branches of mathematics. Number, Calculation, prehensive intellect gathers and arranges the material for constructive intellect.

We include the zone in the intellectual region, in the first frontal lobe, but treat it under the subdivisions we employed for the posterior vertical zones. This treatment does not alter the facts whatever. If we applied the divisions of perception, abception, conception and reason, though their import would be vaguer than it is anteriorly, the results would not differ.

The beginning of calculation is simple. From a few objects, mayhap then from mouth movements, it forms mathematical ideas; perhaps it employs mental representations of the fingers to grasp numbers and relations; later it adopts a language symbol. The process is one of simplifying substitution, which ends again in a tangible physical movement and word. But calculation is likewise served by the senses in their intellectualized form; this influence coming from below and before, and hence an area of order toward the basal angle of the brain and upon the base itself. This basal form of Calculation, which also serves intellect when the eyes, ears and other senses fail in their range, shows itself in the breadth of the forehead above and backward of the outer angles of the eyes, giving the angles themselves the bony prominence well observed in carpenters; labor parades affording excellent opportunities for such observations. The objectively calculative eye is further augmented by the development of the external ends of the upper eye-lid through the habit of sighting, a narrow slit aiding vision. This sighting is resorted to in the common walks of life, especially in the support of constructive intellect, even in the judgment of a person's practical side of character; as when the Jew, though not the Jew alone, sizes up an incoming customer with one eye. The habit easily imposes a permanent mark of vulgarity; and an artist who possesses it is apt to go far into the common details of life, into genre work, instead of revelling in imaginations. Moreover, in cold calculation there is little feeling. The "knowing" wink of the eye is a calculative sign.

Since the area still lies under the influence of the lateral muscle, it is not surprising to find that the under jaw is apt to be conspicuously drawn downward and forward behind when the eye is screwed up in objective calculation, and the same expression is often employed when we expect the accidental breaking of an object.

The calculating process in its upper and ideal forms, attained by an ascent through representations of limb movements, is not so difficult as it appears to the uninitiated. The solution of mathematical problems, and problems constituted of purely imaginative material, is simple and direct, therewithal the laborious efforts many of us must put upon them to catch the relations. A good calculative faculty ever does its work by shortcuts, like those we are familiar with in simpler numbers. When once the area is stocked with facts, so to say, and these need not altogether be gained by a prolonged experience in the case of an inherited area, it may work unconsciously and its results come forth spontaneously. This spontaneous, unconscious and yet original operation can, moreover, take place within any mental area. In the psychical ideal level calculation reaches a point in which the calculative element it seeks is concealed beneath outward, expressional action, as long as the area is undisciplined. And yet there is present a glimmering insight and divining power of the psychical phenomena expressed, sufficient for imitation. Here lies the area of Impersonation, calculative in its essence.

This impersonation is not a prosaic mimicry, except in the case of a weak mind. Impersonation strives for that which lies beyond. It is a mode of subtle calculation by which the higher life was evolved, and what mathematician would undertake to analyze the product consciously! Life is but the result of continual effort to impersonate superiors and nature! In copying its fellows it must put itself in harmony with them, into sympathy with them. When it takes the direction of copying movements of the head, eyes and features, the tendency nicely elicits the capacity of inherited areas and physical members.

The loftiest form of calculation of prehensive intellect is Intuition.

Intellect, prehensive,
  Temporal; occipito-frontal.
  General higher sensations.
  Inclination to grasp abstract representations of the objective.
  Movements of neck, and of the head and its sense-organs.

BOOK VIII.

INTELLECT—CONSTRUCTIVE

THE INTELLECTUAL REGION.

We shall now take up the grand area of intellect, whose highly associative character is concealed from the introspective view by the swiftness of the passing mental currents—by their very commonness. That the fore lobes are the seat of intellect has always been declared by a people of any culture. That acute observer Goltz noted the intellectual deterioration which takes place with their removal in brutes. And still it is often seriously maintained that man can be intelligent without them! In him the very multiplicity of the intellectual functions is apt to deceive. Entire zones and subdivisions may be absent or lie dormant unnoticed. Until he is brought to a carefully prepared test, we do not know how far a person is capable of perception, abception, conception, reasoning, intuition; of apperception. His casual remarks, were they thoroughly scrutinized, mayhap would reveal nothing but repetition and imitation of a verly limited range. In the long intervals he keeps quiet and leaves his fellows in doubt, sentimentally, as a rule, receiving the benefit of the doubt, nor does he do it with any intention of deception. He merely cunningly conforms to the common standard in vogue as far as he can; and this standard conceals both deficiency and originality. Social influence at once lifts the dolt and quashes the genius by compelling them to fit a common mold. A deficiency is quickly made manifest when one is brought to a test upon a particular subject or phase of intellect. Even a professorship is no true measure of intellect as a whole. It is the immensity of the range of intellectual associations, despite their ascent into the simplifying abstract, which renders them confounding. Each zone has a low and high point within itself.

On the other hand, the operations of the emotional and motory regions give rise to mental phenomena and to deeds which are likely to be attributed to intellect. To a large exent both of these areas, when the sense-organs are intact, can manifest considerable independent instructive activity or such as is imitative.

We have spoken of the intellectual zones as if they were connected by short arcuated fibres conveying the existent current upward in its purity, all the other fibres to the temporal, occipital and motory regions being efferent. This may not, however, accord completely with the facts. Both the brain areas and sense-organs improve with the expansion of mind and these accretions send their improved currents to the intellectual zones, which are preeminently associative in function. Whatever brain anatomy adds to our knowledge of cerebral connection in the future, it will be of such a nature as to verify the process here described.

The paramount fact to bear in mind regarding intellect is that it is cerebrally motory, a motory area for the brain itself, a function by virtue of which it preserves a superiority over the sense-organs and operates independently of objective presences.

CONSCIOUSNESS.

The material foundation and physical processes that underlie consciousness, we cannot hope to answer here or speculate upon. Yet we may say a few words upon what apparently takes place and discover a mechanism upon which mind energy plays, or from which it springs.

We may imagine the primitive cell as being merely sensitive, plastically so and thus, aside from its chemical affinities, subject to many or all foreign impressions, responding to them, the response setting its enveloping contractile tissue into motion, say, repulsively. Nothnagel observed that the brain particles are set into action by pricking them with a pin. The nervous effect produced in these primitive contacts immediately would pass out again, leaving no trace behind or only so much as would be effectually removed by the next impression produced by some other object.

Still, such a cell could not live, for it repulsed everything. It must possess an affinity for some one foreign material, which it does not reject and which it takes into itself to make chemical action possible, as nourishment. Such a cell would attract only one element, tolerate the impression of only that one element. It would merely exist in the simplest way possible and, constituting a unit and all within itself, it would have no neural operations but one; it would possess but one element of memory, one neural effect, and nothing else to compare that with. We might say that it possessed mental concentration upon but one point and saturated by that, with that ground into its tissue, would brook no other.

When the primitive cell divides, but the divisions still remain a part of the parental organism, the several cells will naturally come to occupy different positions within the enveloping somatic tissue. The volume including two or four neural cells will inevitably compel these cells to occupy different positions and thus they become subject to different impressions, tropisms, and these impressions will be constant for each cell, the more so as the creature is fixed to one spot. Accordingly the functions of the cells will come to differ and yet they will, in a manner, also act conjointly, producing no discordance sufficient to break up the homogeneity of the individual.

The above division of labor may be carried to an infinite extent, as we observe it in the nervous system of man, in the gray matter of whose brain there are probably more than four thousand cells to a cubic inch, each exhibiting more or less an individuality of its own; each with a special afferent and efferent function and perhaps memory; with some permanently established connecting nerve lines, but at the same time free to establish others. In the babe many of these cells and connecting lines appear hereditary; in some lines, but not in all, the very function is ingrained; others must act generically, in lines determined by the organism, as they did in the parent, but not specifically, even though the physical structures are alike.

It must be remembered that the later, and perhaps all, of the cerebral cells are not subject to direct external impressions from the sense organs, instead they receive their impressions from other cells that are directly impressed. These secondary, tertiary and even farther removed impressions are something entirely different from the original; they recede more and more from the external object toward the abstract, toward the notion and law. *The impressions* which come to constitute the character of the second or third molecule may arise from the cells underlying two or more of the senses.

What really deceives the superficial mind as to the real nature of thought is language. Language is a concrete symbol substituted for the thought, and in analysis it is words rather than the thought which we, with airs of wisdom, expound upon. Thought is a particular cell impression, or the vibration of a series of cells simultaneously or in succession, the current passing into the language area because of habit. Thus, while language aids thought in coming to simplified, clear and fixed forms, it at the same time limits it, men, as a rule, thinking no more than what words convey to them, often hinging closely similar mental states to the same word, as in the case of "I." Their cell vibrations and interplaying currents eventually become set and they are incapable of freedom of mind, even though they yearn and strive for it; a set though wide psychic range is not freedom.

So far we have not made much progress in elucidating consciousness, though we have gained an idea of the hierarchy of mental elements and of their basis. We have seen that a single nerve-cell is incapable of consciousness, but even when there has arisen a complicate mass of cells and a unity of function and feeling, the cells all have their definite evolutionally established offices, the currents passing into them and out, creating no further psychical perturbance. Each cell or group of cells being peculiarly set, like so many different watch springs. In conjunction with the peripheral structure they have come to be molded into a form, in the process of time, through environment and habit, to which they spring back and which could be changed only in time or by force under favorable conditions, temperature and so on. Each physical form produces its specific effects. With less obstinacy the same conditions obtain within the brain and cortex, the cells, especially those of the fore and back parts of the hemispheres, existing with considerable plasticity for details; some possessing no specific function, except as the area is generically restricted, yet they amorphously respond to many and each new impression without retaining a fast memory of any. Since there exist no definitely strong and attached lines of communication, they are capable of considerable freedom, especially with regard to the neighboring cells.

Now consciousness takes place at the moment when two or more nerve currents meet in some other than a routine and perfunctory way and with a proper intensity, maintained by attention. It stops with the cessation of the currents, whatever be the cause for this cessation. In an unbroken consciousness one combination consistently passes into another; there are no violent leaps in a sane mind; and thus to hold an impression before the mind new elements must be constantly added to it. The content of consciousness varies with the flow of thought as long as that flow is not in established routine combinations and channels. To a keen observer it is most depressing to see what automatons most adult human beings are; rarely do they experience a vivid flash of consciousness, springing above all from the frontal lobes.

In accordance with the above facts a faint consciousness is present whenever an original neural conflux occurs, one to which the cells are not inured, in animal or man. Its vividness increases with the associative capacity of mind and above all with that of intellect. Our forgetfulness and new experience forever stimulate it. In man it passes the mile-post of self-consciousness, when the consciousness of the self, steadily generated by the varying pleasurable or painful experience and vibrations within the organism, inclusive of the brain, is forever impressed by the transpiring panoramic activity of the brain whose phenomena seem to stand over against the self as its mind.

This explanation, which is not said as well as it might be, may be difficult to grasp by the inexperienced, but for no other reason than that it is not the traditional view and has not been ground into them from the cradle up. They have not been led to trace the processes, despite the existence of nature's proof, and to develop them distinctly and clearly enough for the mental eye to grasp.

CHAPTER I.

PERCEPTION AND ABCEPTION.

Base of F. lobes.

In the case of intellect there is a clear grasp of the world, beginning with its details. The organic factors which enter into emotion are reduced to a minimum while the sense-organs have gained in importance, even the lower self falling under their scrutiny. The resulting inductions constitute thought, a mental state of expectancy, nor need thought always rise into the introspective view of consciousness. The association of cerebral currents is now an all-important matter, the currents not only originating in the sense-organs but also in the lower areas; the resulting ideas are twice and thrice removed from the objective.

Upon this stage of mind, in which reposes the power of forethought, I could dwell for many pages. I could also deal at length with the various intellectual processes, but these of all the mental problems have been most successfully grappled with by psychologists and metaphysicians so that, though there remains much to be learned, I content myself by naming some grand divisions and the approximate location of the supporting brain areas, and point out the cranial muscles concerned. The body end in each case is found in the increased regulation of movements, besides in the increased adaptability to movement of tissue and limbs.

Intellect demands a supreme quiescence of brain stuff, *through* which it is possible to hold a subject before the mind. Its region occupies the frontal cavity of the skull, the upper layers again lying upon a quieter bed than the lower. It appears when the motory functions of the head have been mostly transferred to the limbs, though all action tends to cease in deepest thinking. The cranial muscles, thick and immobile in savages and barbarians, overlying the highly cultured area, are of exceeding delicacy, and so are the touches of the eye-balls upon the roof of the sockets. Nearly all the external cranial factors are concerned with sight, and sight is the predominant sense of intellect. Even the lower creatures raise the head aloft and hold it still when indulging in their embryonic contemplations. Study favors association and the augmentation of the mental content.

However embryonically and poorly it sometimes succeeds, intellect seeks for uniformity of antecedents and consequents; for cause. It seeks to eliminate irregularities. Its material comes to it many times sifted. Its evolutional progress was out of a preparatory prehensive zone, that grasped the objective representation with a faithful exactness, into the constructive zone where there is a characteristic drifting away from a rigid conformity to objective reality. Intellect as constructive is creative, in that it creates a psychical world for the self which may correspond closely to actuality or lie far removed from it; uniformity is sought at any cost. Its results are more or less tentative, imaginary—the one requisite being that whatever direction a thought system takes, its elements must be arranged to maintain a sort of consistency with respect to each other. It is but a mode of calculation that operates with great freedom. Nor can we at present hope to bring everything down to a mathematical exactness; it would require a brain as big as the universe to do that. Thus we content ourselves with guessing, which at one stage we call imagining, and in its loftier phase, we call reasoning.

At their beginning the processes of intellect are almost completely imaginative, to which the history of the race bears witness. And, as I have said, what is sought for are those constant representations and relations which govern particulars, and finally the universe. In this striving there is a continual effort to escape the cruelty of evolution through a knowledge of and conformation to its determining principles. It is for this reason, though at first it does all out of respect for self, that thought aims after impartiality of analysis and synthesis.

It will help us to understand the divisions of intellect by bearing in mind the horizontal divisions of the entire brain, and its processes, and especially of the social emotions. The lowest area is that of Perception, lying upon the base of the frontal cavity and rising somewhat above the orbits of the eyes externally. The elements perception brings before the mental view and into relation are the simplest and are derived from the crude material the lower brain furnishes. They are connected with those sensations which are of immediate import to organic existence, and generally are awakened when the objects are present before the senses—the objects may have their source in the self. Thus, an object of food is intellectually known by but one or several qualities. Organic wants suggest these qualities; or the qualities suggest the idea of the wants. In these cases we have memory indeed, yet the memory of the qualities and relations vanish from before the mental view with the disappearance of their representatives. Moreover, conscious memory tends to pass away when daily and habitually repeated. Remove the perceptive area and this limited capacity for grasping the significance of things also disappears; the creature again becomes one of reflexes, of tropisms. The simple percepts are expressed in sounds which constitute proper and common nouns, as it were, and concrete verbs in the singular number; by denotative rather than connotative words.

The power of perception again improves with the improvement of the organism. The brute possesses no auditory capacity for that musical perception which can follow a melody through. His eyes are set divergently, for general observation. He makes no fine distinctions in color. Intellectually all is a blurr for him. The power of perception, that the sulci also augment, increases with the forward length of the areas, when then the number of cells are sufficient to serve a wide range of special and permanent memories; encroaching memories upon the same cell will then not appear, one to annul the other. A perceptive idiot, and this remark replies to all forms of intellectual idiocy, generally perceives more than he can remember. For him the world passes in a panoramic view which is constantly new. Such persons may even read difficult books, but the matter immediately glides off their perceptive cells again; they consequently lack the material for loftier associations. After a firefly gleam all is darkness again. What is permanent in them is what a small granary of unperturbed reserve cells holds. Furthermore, when a double service is pressed upon the brain particles, it is likely to tinge the new, associative impressions, with false elements through a mingling of imperfect vibrations or memories. The length of time a memory is retained after the sensory connection is severed seems to be from three to four times the period during which that memory was in the process of formation through repetition. On account of the versatility of intellect, its memory is more subject to passing away than that of a lower area functioning, though sub-consciously, in the everyday round of existence.

From two or more simple elements Perception arrives at an induction, and this, at first with respect to smell and then to taste. Within the intellectual region we therefore meet a sort of reduplication of the posterior brain. The areas for taste and smell are located in the inner side of the longitudinal egotistical line encircling the brain; and the passage of air through the nostrils and the suction of the tongue upon the palate undoubtedly played a suggestive part in giving them location, in addition to the chronological necessity for the appearance of the functions. The center of smell appears to lie in the lobe inward of the sulcus rectus that covers the olfactory bulb; though inwardly of it again there may exist an area which perceives certain simpler tissue sensations. The center of taste lies upon the outer side of the sulcus. Both centers taper toward the front and in their ascent. It is rarely that either of the functions is extensively elaborated in the vertical limb, in daily life.

Next in order comes a center of touch, evolutionally preceding the use of the eyes. Then come linear observations by the eyes alone. The perception of form is a synthesis in which both touch and sight are involved. At this point a great variety of perceptions are already possible when the centers act associatively. To linear perception is added that of color; and next that of sound, rarely attaining much breadth and prominence upon the front of the forehead. The range of observation of the different centers reposes in their breadth. Breadth stands in contrast to depth in that the latter indicates extended mental penetration and association. The centers most *closely allied* to individual and personal interests are those located in and near the median longitudinal line. Outward from that the interests grow more and more material, unsympathetic, cold; in verification of this fact we might point to the character of the ancient Egyptians, possessing low and broad foreheads. Nor was the high forehead a national trait among the Greeks; whose foreheads thereto, were narrow, and well portrayed in their head of Zeus.

In perception the intellectual elements are confined to individual existences, but in its upward progress it attains a form and extension to which I shall apply the name abception—a process which might be called apperception, were apperception not involved in all associative processes (see De Garmo's translation of Lange). In abception there is a grouping of percepts in the arrival at new results; it is therefore a kind of multiple perception. The presence of a number of percepts simultaneously widens the horizon of intellect and marks the beginning of conscious memory. There is now more abstract material to discover relations from and an increased motive for recollection. The mind now views a moving world of its own. The percept was limited to constitute a unity within itself, but here these units are brought together to reveal greater ones. There is a demand for the dual, plural and collective noun and verbs.

Abception gives birth to the phenomenon of intellectual will. It fills the mind with a dynamic life; with moving persons, creatures, things, in their respective forms, sizes, shapes, weights, colors, sounds, taste, smell, and more. It gives rise to the grasp of space, which is nothing else than extension as it exists between objects; and to that of time, the interval mind experiences between occurrences.

With the advent of the area of abception the world is no longer a great flat surface, though intellect still clings to the concrete antecedent and consequent. Laws and energies are still dimly recognized, are personified. It marks the beginning of institutional life—when affection also comes into prominence. It marks the beginning of the age of story, illustration, myth, tradition; language also grows with its multitude of inflections and conjugations, a very reflection of the struggle intellect makes to extricate itself from chaos. Tribes and governments are patriarchal and clannish, strong physiological characteristics manifesting themselves everywhere. All mental progress is made still largely through the hard knocks of experience; all is empirical; tangible, as it were, illusions nevertheless.

The area of abception extends below the central line of the forehead. The forehead, retreating above, indicates, unless more prominent than a large upper zone, a low level of intellect, but not a degenerate and criminal one. Its morality is in proportion to its development. According to its level mind is brutish, savage, barbaric, civilized, humane or divine. In the merely perceptional and abceptional stage the forehead, presupposedly conforming to the shape of the brain, tapers from the base toward the top, both from the front and the sides. The typical head is that of the American Indian, whose perceptional and abceptional mental capacity is well shown by his abil'ity to trail game or an enemy which left no tracks, apparently, behind it; it is shown in the conduct and observances of his simple round of life and existence. These areas yet exercise little control over the lower ones. In ordinary life they manifest themselves in picturesque garrulousness and gossip, in apprehensive wonder—and yet they must enter into the foundation of intellect. In time their content comes to conform approximately closer to reality. When Perception is deficient, Abception becomes imaginative and unreliable; Reason becomes worse. It is when Abception is well stocked with story, tradition, with memories of nature that Conception and Reason are the more cogent. But the stock of the abceptive area in itself is, like so much learning, raw material. It is often true that a large basal observative zone of the intellectual region interferes with the upper rational processes.

The subdivisions of Abception correspond to those of Perception, their respective breadths being maintained by the extensive observation of groups, by the many possible combinations of percepts, and by gregarious imagination. In higher culture the median centers often become so much dwarfed as to leave a vertical trough in the center of the forehead. When the median line is prominent and not checked by broader interests, we get an unmitigated selfishness. There is no intellectual altruism where there exists no depth and breadth of the lateral centers. "Ignorance is bliss," and it is a naive ignorance which gives individuality its forwardness. It cannot maintain itself in the face of comprehensive intellect. The Greeks' egoistical love of prowess in their games, their lack of political unity, their independence in thought and art all bespeak their individuality. The confinement of their art to sculpture, in which the simple noting of physical proportions is necessary, yields the proof of their material narrowness. That they were epicureans in respect to the lower senses, we may rest assured.

It is only certain properties of extension that enter into individuality, but size and weight do not; nor does location, the notation of an extended magnitude. With the increasing breadth of intellectual observation, the eyes gradually move from the divergent to the convergent position. In the straight-forward position they are best placed for the estimation of weight, and the center of weight rests over the middle of the eyeball. It may appear that this position is that most favorable for linear judgment, but we judge of linear dimensions with divergent eyes; moreover, at the same time eye movements themselves are necessary, for it is from psychologically noting the play of the eye muscles that we really derive much of our information (Wundt). Color succeeds weight. Its estimation again depends upon a steadiness of the eyes and upon their convergence for closer scrutiny. Beyond the center of color ocular observation diminishes and its place is taken by that of the ear. Still further back the process becomes calculative.

We observe the language of Perception and Abception in the open eye, open mouth and pricked ear. It is the eye that is particularly expressive, and intellect is extraordinarily dependent upon its service. The eye is its most diligent servant. At the same time the eyebrows are also lifted, conformably to the phase of sight and the intellectual center most active, though the outer extremes of the brows refer to lateral areas. This lifting of the brows, of course, relaxes the muscles lying upon the lower part of the forehead. When this relaxation is aided from the point of the occiput, the emotions are repressed, and that intellect tends to be unaccompanied by the social emotions needs no argumentative proof. But when the occipital band is relaxed percepts sink into indefiniteness, while the emotions become all. The protruded eyeball in wonder and in fright also produces a relaxation of pressure upon the roof of the socket and favors the congestion of a low perception. Moreover, a certain steadiness of the eyes is necessary for a well adjusted perception to take place, though fixedness prolonged again betrays mental blankness. Any twitchings of the eyes proverbially betray a *confused state* of perception or of its memories. When other senses than the eyes are those dominantly active in perception, the latter tend to assume a vacant look.

Upon a well developed intellectual area the overlying skin tends to lie smoothly but not tautly. Nor may the scalp and muscles be glued down anywhere, especially upon the upper part of the skull, if alertness, versatility and unbigotedness of mind is to exist. A set scalp signifies a set mind; but where a frontal area is still not charged to its full capacity, the skin, instead of lying smooth upon it forms into horizontal or vertical wrinkles; the outer plate of the skull as well as the inner seems to sink or rise. This, however, is not to be taken as an invariable and absolute fact; as, for instance, when there is a vertical groove in the center of the forehead prominent lateralward, the skin is stretched across this groove. In that case, in as far as the integument is concerned, the natural conditions are favorable for the expansion of the center underlying the groove and for the repression of those beneath the prominences. Such conditions as these favor the even development of the cortical surface.

Perception involves only the very border of the frontal band of the great epicranial muscle. In Abception the frontal band is involved below the horizontal middle line of the forehead. Normally this area is well developed in man; it is not sunken and wrinkled, and exhibits a fullness of its peculiar memories for places, things, persons and events as these fill life. But neither in Perception or Abception does the occipto-frontal control without modification. Musclets of specific function co-operate with it and independently of it.

The pyramidal muscle, rudimentary or feeble in the lower mammals, ascends from the nasal bones and passes between the eyebrows to find attachment to the skin at some point near the central part of the forehead. It over-lies the strictly personal area of intellect that, when deficient precludes a certain range of interest and sympathy for others as well as for self. Since the muscle in contraction indicates a deficiency of attention to those factors which are of immediate importance to the organism, it produces the look of severity with good cause when contracting. The contraction brings about a temporary effect similar to that of the vertical hollow in the same location. Herodotus, I believe, is traditionally portrayed with the vertical hollow and with that and his breadth of forehead he could not have done otherwise than to produce the great but simple and lacking in human interest historical work he did. Shakespeare, Goethe and Wagner possessed a great depth and also height of the frontal lobes. The forehead of Alexander the Great exhibits a strong individuality and his success depended upon his personal aggressiveness. The wings of the nose are easily raised in conjunction with the pyramidal muscle, betraying the bad odor in which a person or thing is held.

The superciliary muscle is fixed to the skin near the head end of the eyebrows, from there ascending upward and inward to find attachment upon the frontal bone above the superciliary arch. When this muscle contracts upwardly it compresses the observative zone, except about the median line, and causes the appearance of the arched transverse wrinkles. These wrinkles are expressive of pain, physical or moral, intellectually or emotionally felt, because the outward regions of the fore and aft brain are held in abeyance while the skin over the median line is relaxed. I need not repeat that the sign upon the forehead may follow in the wake of organic conditions. Persons of a sickly or sensitive nature are apt to exhibit this sign permanently, but save in exceptional cases these display a fine feeling and attention toward the experiences of others no less than for those of self. When the superciliary is relaxed or extended downwardly an undue interest in self ceases. The resulting expression is one of health and joyousness. Moreover it indirectly relaxes the skin over the area of music and song.

Hence we see how it is that thought is written upon the forehead, whose expression tends toward placidity with non-effort, and especially in sleep and in the blind and deaf in whom the external sensory stimulus is cut off.

CHAPTER II.

CONCEPTION.

Frontal lobes, at middle and above, of forehead.

The zone of Conception runs approximately through and somewhat above the horizontal center of the forehead, on the level of the ideal.

At this height intellect, removing from objects and senses, begins to deal familiarly with ideas; it is doubly imaginative. The abcepts and additional sensory currents run together, similar or like ones producing a cell whose vibration constitutes a "notion," a concept; horses are subsumed under the idea "horse"—nowhere existent; steps become walking. Conception might be taken as the perceptive stage of pure abstraction. The collective noun is dropped for the abstract noun. In the concept, though the percept and abcept may be present simultaneously, the mind beholds nothing objective. The concept is abstract, psychical, elusive, dealing with energies and principles; its concrete representation within being too often performed by the word that is made to usurp the place of the true idea—and instead of dealing with abcepts for verification, we fall back to these oral conventionalities.

Conception lies upon the level of ideality. Many of its factors and comparisons, more so than below, are tentative conceits, that is, at its origin and upon its outworks where the currents run together haphazard, having not formed established channels and consequent inductions, concepts which answer to a stable reality, be that reality psychical or physical. It is the climacteric zone of imagination in the sphere of the abstract; that of hypothesis with respect to notions and laws in their static form, all being done in the search of universal elements.

In the occiput, on the same level, the emotion rises predominantly into the atmosphere of sentiment. Henceforth social life passes from a hard utility, from matter-of-fact to poetry; receiving more color, music and joyousness. The being seeks an increased adaptation to invisible reality. The myth becomes refined. Heroes are lifted to the proportion of gods enjoying unbounded freedom and deprecating unintelligent license, brutishness, mere materialism. There is a rise of personal estimation and respect.

The outermost extremes of conception are bounded by the area of ideal music. Within the extremes of the zone phrenologists have placed a center of mirth, but why? Such a center is influenced by music, yet that is not all. The intellectual region by nature tapers toward the top, but so far, because of the limitation of the range of sight, its fullness has been maintained by the immense possible number of grouping of particulars, by imaginative play, certain imaginative cells even becoming permanent. It slopes up from the sides and in front, but the slopes are, like they were in the lower areas, filled out by imaginative elements, if not by representations answering to reality. Secondly, this zone is as a whole conducive to laughter, most so at the extremes, for toward the center the concepts, concerned with matters closely bound up with habit and existence, have reached firmness. It is the new combinations presented to mind, whether their source be in imagination or in reality, that appear ridiculous and make us laugh—laughter is the inner, organic play arising out of a mental attitude of superiority. Where imagination then sports mostly there is found the strongest spring of laughter, but the mental state must be that of intellectual imagination, which conceives distinctly matters lying outside of the self. The matter-of-fact, into which imagination iself may be transformed, no longer draws forth the laugh. The brute's close confirmation to material reality precludes its laughing power, in spite of the intellectual capacity the creature does possess.

The feature language of Conception we shall leave for the exercise of the readers' ingenuity. The zone is practically covered by the same muscles as those below it, though the occipital band exerts more influence and the independent musclets on the forehead, less.

The eyes now also begin to assume the peculiar expression of thought, a half inward look, because perception cannot be intensely originally active with conception; the same expression, the withdrawal of all motory impulse, being increasingly noticeable over all the plastic parts of the features. It is often said that the lowered eyebrows are an indication of a thoughtful mind, and while it is true that a certain lowering of the brows and contractions of the eyelids are necessary to preserve conceptional concentration and abstract attention, in that they draw the curtain before the sense-organs and produce the appropriate moderation of activity in the cerebral area—a strong compression acts adversely upon the abstract zones themselves; the end is more characteristically accomplished by the dreamy gaze. The permanent expression of the strongly contracted brows at once rightly betrays dullness and slow-wittedness, or when it is resorted to to produce an impression, we immediately recognize hypocrisy.

Should anyone be impressed sufficiently by these explanations to be moved to trying the experiment for himself, he will soon find that he recollects some forgotten *idea or fact* the quicker when the skin and muscles upon the forehead are rather relaxed than tightly drawn. Too much relaxed they induce a feeling of intellectual flightiness, too tightly drawn they induce a feeling of cerebral oppression and a retardation of the mental processes, of perception and abception themselves; at best they then indicate a set opinion and are more tolerable in later life, when, presumably, the truth has been learned by experience. Generally memory does not serve one, the underlying nervous operations not taking place, until in forgetfulness of the effort the forehead brightens. In the case of imagination it is ridiculous even to think of a darkened brow and compressed forehead.

CHAPTER III.

REASON.

Upper vertical portion of frontal lobes.

With the ascent of intellect the simple and aggregate representative zones lose in the content of their meanings but gain in extent, in scope. The concept is already retroactive, it will recognize a thousand and a million men or their special acts without the necessity of a special memory for each of them. It will thus leave a large number of perceptive and abceptive cells free and amorphous for the observation of new and additional details, and among these will naturally be details of deeper significance and which escape the first untilitarian glance or the attention of another sense. Thus enlarged observation gradually fills the gap conceptive imagination was called upon to fill, whilst imagination moves a step further on the frontier.

Concepts are more permanent, or rather grasp more permanent data, than percepts or abcepts. Particular cats come and go, but the concept "cat" will have value as long as traces of the species are available. The same is true of the concepts of relations; as of heaviness or of lightness. Conception being free from crude material, that serves it only for illustration, forms a product which favors subtlety of mental action, in which the abstract is posited for the concrete. The language of perception when employed becomes figurative.

When now the concepts of things and of motions or *energies run* together, to which currents from other higher levels of the brain are added, the new cell produces an effect still more abstract than any hitherto appearing; an effect a degree farther removed from the presentative material beneath; an effect whose value is still more enduring than any hitherto obtained, as lasting as mind and as the universe of spheres. This advance abstraction, delving deep into the invisible, subsumes, for instance, all living things under organic; all energies of the first degree and directly observable, it subsumes under those higher. It deals with entities and dynamic somewhats intangible to the senses; with the abstract and relations of the abstract; with effects and causes. Heat expands the metals. Hence, if a hole be chiseled into a rock, a piece of iron placed into this and heated, it will break the rock. How long would it take empiricism, if accident did not favor it, to arrive at this expedient? Again, empiricism must first see the jug broken by freezing water before it will take precaution. Indeed most knowledge of this sort is arrived at subsequently to experience, but after the conceptive area has been established, there is no need of it, unless it is to obviate the forcing of the intellectual association and to indulge laziness.

We shall call the new area, which elaborates the concepts, that of Reason, because reason, already present heretofore in a crude form, here attains its purity, its freedom. Under reason we shall subsume the concepts based upon concepts, the ideational abcepts, that here take place. Both these concepts and those conclusions arrived at in regard to energies we shall call sequents, a term equivalent to reasons. The term should not trouble us when we recollect that we can look upon energies, invisible vibrations and relations as objects, or, conversely, upon objects, from which concepts are derived, as modes of vibration, which science has proven them to be. It may be said that all the intangible mental phenomena are, after all, but figments and, sophistically, next say that they are worthless. However, the brain and mind are as constant as any other observable phenomenon in the universe, what though personalities pass away, and consequently are just as real and trustworthy as they are—in fact, they constitute a part of the universe. What is more, the ultimate energy, the soul, which the cerebro-spinal tract supports, if not inmmortal, indestructible, not correlatable, is yet higher than any other we know of, with the exception of the First Cause.

Reason is also pervaded by imagination in the same manner, though in a different form, as the inferior zones. Indeed, it is situated in the spiritual ideal zone, and throughout the story of history its conclusions, its most solemn logic have always been tentative. Thus it is not presumptuous to predict the development of a superior, more truth-seeing constructive intellectual area.

Because of Reason's deeper insight its risible attitude takes the form of humor, tending to a breadth of sympathy. This is inevitably so on account of its extended causal insight. At its extremes, as we have said, the rational zone merges into the optimistic area. As the area may be low and reason deficient, so it may be overhanging, its function then overflowing with imagination and fantasy, its products not congruous with physical reality, since they are not consequent upon an orderly evolution from the sense material; and being without solid foundation, they do not tend to produce a serious mood.

But at its forward depth and at its breadth, upon the frontier, Reason is not always evaporatively sportive. When on the right path it then gives birth to philosophical poetry, that foreruns science and philosophy like a pillar *of fire.* If the poet sees the abstract fact without consciously plodding through all the logical steps, without eliminating all extraneous associative currents, that is no argument against his brain in the main arriving at the right conclusions. In intellect as elsewhere conscious interference and effort often but lead to confusion, to the introduction and fixation of completely irrelative currents. In reality the scientist and poet intellectually proceed in the same manner; the former trying to prove less, in spite of his finical resort to details, than his reason and its imagination reveals to him; the latter rarely stopping to put his inspirations to the proof, nor is he uneasy if he is not self-conscious at every step. The one cramps reason, the other is apt to give it too much rein. In the course of the world the hypotheses of science have oftener been overthrown than those of the truly inspired poet, and inspiration is today far in advance, though only a few comprehend its meaning. The very fact that the scientist laughs at the poet betrays the limitation of his own insight. The fool laughs at the wisdom of the wise. The great factor upon the side of the poet is his heightened mental stimulation in contrast to the lagging, dragging mind of the scientist who forever limits association by keeping his mind concentrated upon a single point. When the cerebral areas begin to be charged to the full in the adult, or when they shrink with the decline of old age, imagination disappears and originality and the expansion of mind are at an end; but the same arrest takes place when the area permits of no further multiplication of cells because of a lack of room.

The zone of Reason manifests its states upon the cranium in the relaxation and contraction of the occipitofrontal muscle. It may come about that the tension over the area is affected by the depression or prominence of an inferior or superior adjacent zone. This idiosyncratic difference in the volume of the different zones is what causes men to view the world so variously, in narrow and stubborn ways or freely and rationally, each in his own way, after the range of experience, according to the architecture of his brain and its physical connections. Having once entertained a view several times, they tend to cling to it, and if laziness also enters mind strengthens its fences by the wall of insolence.

A state of the skin and musculature upon the forehead which we have not yet fully dealt with, is that occurring when the intellectual areas are used to their fullest capacity, causing the skin to lie smooth upon the forehead, development thereafter being made against the increased resistance of all the overlying cranial parts. A small but smooth forehead, therefore, signifies a full and alert activity of the area present, however small its range. On the contrary, a wrinkled forehead betrays unused cells within an area, but at the same time, if the brain in the latter instance naturally is of large volume, the intellect may be that of a genius whose limit is still far from having been reached.

Furthermore, it is always one thing to have the brain cells of the areas and their connections developed, and another thing for all the different areas to stand in a complete associative connection. In one case the idea represented by a cell is poor and of an automatic nature, in the other, rich and capable of choice and spontaneity. Or if the content is merely gotten from some other person, by imitation—possible only to a certain extent— the mind lacks freedom, originality and self-reliance, the power of continuous thought. The Mediterranean races, for instance, are not inferior to the Teuton in all mental powers, but, in respect to the use of machinery, they are— *the deficiency* apparently being of a motory nature.

Mayhap they may learn how to use a ready-made machine but they cannot keep it in repair or do more than they are taught.

Intellect, constructive,
    Epicranial.
    Cerebral association and higher sensations.
    Pleasure in abstract association—Inertness of intellect.
    Cerebral innervation.

CHAPTER IV.

TUNE.

Outer border of 2 F. C. and 1 F.

The area of tune is really a part of the constructive intellectual region, but it also stands in a close relation, as to seem almost a special direction of functioning, with Calculation. Its separation from the constructive intellectual area, as a section of that, is justified because its principal sensory material is that of sound; it functions when the range of sight no longer suffices. Of the muscles upon the forehead it is not governed by those that regulate the sight region, unless it is by a reversion of the direction of the activity of these.

The area is superimposed upon the sides of the forehead, its prominence giving the forehead a square and even homely contour. At the base it appears to be an extension of the sound center, beginning above the ear and extending forward through the areas of Language and Calculation. The area deals with the intellectual and the perfected result is what constitutes music. Music is a composite product. Time and motion enter it, so does calculation. There is no reason for naming the area that of tune except that sound appears to be its principal element.

Music is associatively concerned with other vibratory elements than those of sound. It takes up the internal vibrations of the organism from the lowest to the highest and reproduces them, or tends to, externally in some phase, interweaving them with sound; and that is why the body or mind so easily responds to music, the responses being intensified by repetitions. Time, timbre, rhythm and numerous other means are considered to produce these effects, reflections of the silent inner music of our being. Accordingly it is not strange if some music has the power of restoring the sick body to healthy vibrations and the insane mind to sanity. It can likewise, on the other hand, be employed for disorganizing purposes.

There is no reason, we repeat, why this area should be confined to the manipulation of sound. It may turn to the associative manipulations of the vibrations of color; to those of intellect and emotion, though with more difficulty. When in these later times music to some minds calls up pictorial representations, colors and life, that is no vain pretension; that is an inevitable step in its associative expansion. It is a breadth of this sort that makes the music of Wagner great and prodigious.

In its simple beginning music was connected with physical movements, with the area of order, with the vocal organs, and it is through the vocal organs that the best music is still produced, though not by everyone. It is the human voice, setting forth and conveying the human vibrations, that in every way most thoroughly and deeply arouses the human personality. It is a case of one body setting another into a like vibration. In a way the center of tune is a second language area, hinging its unspeakable meanings upon additional vibrations that are added to words in song, the words often counting for nothing. It is more than probable that number started in connection with mouth movements and sound. Tune is a second center of organic expression, producing physical twitchings that cannot be seen upon the skin. It resorts to the hands, feet and entire body, in addition to the mouth organs, for its outward constructive efforts. Nevertheless, music in its calculative ascent also transcends material facts in lofty calculations that the mind can no longer grasp or follow, much less the body. Superiorly, it is full of fanciful and of ideal elements, of fantasy and joy, laughter. It is aspiring and, in some of its productions, defiant of any laws we can formulate.

It is the most developed music, especially instrumental music, and that which deals with intellectual factors, which is hardest for the mass of the people to appreciate and endure; since they are neither born physically attuned nor educated to it. They do not catch the finer vibrations and relations at all. The same music is the most potent when appreciated, when the organic structure has been built for it, as it is the most useless when unappreciated; and yet low and high music are better intermingled. In what manner Tune will yet deal with color, delineation and other sensory factors in music, is a problem too subtle for us to solve; we must leave it to the future. Thereto, as the area becomes more comprehensive, the lateral expansion takes place upon a higher level, more and more of the elusive and infinite ideal and spiritual elements becoming involved until the summum of art finds expression through soul upon soul. Music is not haphazard play. It is both playful and serious. To suppose that the first laughing, joyous outburst will not become a sober matter later, is to err, unless it is in the case of a mind of limited mental capacity, and memory. But of this matter we shall have more to say in speaking of laughter. Music must ever continue unfolding in order to maintain its life and charm. Intellectual isolation in any form means death.

At the base the area of tune seems to be under the suggestive influence of the eye-ball. Because of the fibres of the temporal muscles involved upon the lower portion and posterior margin of Tune, it finds a featural expression in the prominent and forward poised chin, as we observe in the portraits of Bach, Beethoven, Wagner. The anterior muscles of the ear are also concerned, as to sound, undoubtedly more than the temporal, and there is such a thing as a musical form and poise of the ear. But there are certain states and movements of the scalp above the frontal area, and lying over the ends of the fibres of the temporal muscle whose workings can be seen, which are also full of significance, their relaxation permitting a relaxation of the scalp above the area and their contraction tightening it. The muscles concerned are those of the eyelids, the pyramidal, the superciliary and those at the angle of the mouth. The contraction of the three former, the fourth acting in conjunction with the third, give respectively the expression of reflection, that of severity and that of pain; or they may contract in various combinations and in every case draw upon the musical area to modify its product. Mournful music does not attain an extensive and remarkable development. It never crosses its frontier. If the contractions are permanent when then, as we shall later see, they betray certain stunted or arrested states of mind, the musical or art area is, of course, effectually squashed. When they are constantly and properly relaxed we may at least look for a buoyant, if not an earnest, musical nature, which remains so associatively when original acquisition is no longer possible.

It is the connection of the emotional areas of sense with Tune that gives music its emotional tinge. Thus a large area of Vigilance or of Cautiousness demands an enormous stimulation to keep it buoyant and in proportion to this buoyancy is music and life positively emotional.

BOOK IX.

THE DIDACTIC ZONE

CHAPTER I.

VOLITION.

Upper portion of Sup. Par. lobe.

With approbativeness the mind is still not emotionally self-confident, self-reliant. Its emotion does not yet feel itself resting upon a sound basis; it is still lacking in substantial works. Knowing its shortcomings, it yearns upwardly for greater perfection; upward in the direction of the summit of the prehensive zone, for it is psychically prehensive, whither veracity also tends. These preliminary glimmerings and yearnings are everywhere present in the progress of mental evolution. They appear to result from the presence of a forming new brain tissue in the cells of the old area, a process which does not take place so noticeably, of course, when an area evolves under an independent cranial musculature and sensory elements. The persistent yearnings in the young and old who lack proper experience are due to this cause.

As for the neural and organic tissue in general following the direction of the upward yearnings, we have referred to that elsewhere. The neural tissue appears more readily to rise toward the subtler forms of external stimulation, and is aided in this rise and located in the main channel by the tensions of the spinal and cranial muscles. The muscles aid it in following the sense-organs, psychical aspiration later taking the same direction. It goes on until the highest cause is posited in Heaven above, in opposition to which lies Hell below. If this attitude of mind must be corrected, it is difficult to foretell what the effect upon the architecture of the brain will be, in regard to those areas located uppermost, particularly. The lower brain areas are themselves looked down upon by the upper that seek to improve them, often to eradicate them. But, as said above, the muscles also tend upward, following the senses, a peculiarity which makes mind-reading possible. This inclination operates toward the lifting of the body into the erect posture and then extends the head in the case of the loftier social emotions.

In the cerebral and cranial topography it is in the area of volition, firmness, that the emotional ego reaches the pinnacle of the temple built by itself. At this stage it has gained psychical contact with the universe enough, whether actually or imaginatively, to give it a wide range of assurance in its personal and institutional proceedings. It feels it is right, in the main at any rate; from an intellectual source of a corresponding level it comes to feel assured that the laws of creation are upon its side, though still it remains liable to presume to know more than it does, and to err. Man after all shapes everything to suit his nature. Yet volition does enjoy a wide scope of freedom, on account of its wide range of correct adaptation, and consequently is inclined to cut loose from the approbation of its fellows and assume a conquering course of supremacy, often regardless of consequences and defiant of the universe and God. Bursting with a fullness of emotional energy, man now no longer hesitates in determining upon his own course, at least in regard to matters that are of earth; though in a morbid elation and ambition he is disposed to neglect inexorable nature herself. He may be wilful, most arrogantly wilful and self-destructively so, according to the measure of sound restraining intellect he possesses. With a low forebrain and a large Volition, he may exhibit a senseless, ridiculous, assinine wilfulness; stubbornness. But a hale firmness, standing upon the rock of reason and truth, is the most awful and irresistible of earthly unalloyed emotional energies; for it cannot be circumvented and moves others by a sheer brute-like psychical force, by willing it. It plays with inferior creation, and may do so unscrupulously to the harm of its own safety and welfare —it is not yet free from, because not in a complete harmony with them, the laws of nature and the universe.

Volition, deriving its intense acquisitive character from its location in the prehensive zone, cannot stand as an isolated bulge at the back and top of the head, or it would be like a steeple without sufficient base and buttresses. It must be supported by the foundation of a whole brain in its human perfection and refinement; it must still be subservient, though commander. It must possess physical warmth, intellectual acuteness as well as motory promptness. An unshakable firmness comports itself with truth, shoulder to shoulder with causality, with all the relations mind, at this stage, can grasp; otherwise its mask will soon be torn off and its thunders cause but laughter; its silent influence will have gone and its words lost their spell. So, likewise, an actual infidelity is a foolish sort of firmness.

The blindness and doom of volition rests in its egotistical pride. Its power and salvation rest in its breadth and proper moderation, in its connection with veracity. Farther down lies the area of sublimity, and the aspiration of volition truly transcends the material sublime.

It is also strongly tinged by the social emotions, being influenced by these as intuition, in front, is influenced by the constructive intellect. The lateral parts of the area are often more prominent than the egoistical, because the self has not been drawn out and brought into prominence in its fulness, on account of an inordinate emotional attention paid to others and to things, on account of cranial muscle idiosyncrasies. So it also comes about, through intensity of interest civilization displays toward material affairs, that the base of the brain is generally more the prominent centrally; below the interest is in self, above, in externality.

It may be asked whether or not man can attain a greater emotional altitude than that attained in volition—a center, nevertheless, which is transcended by divination. Would he make himself liable to the confusion of a second Babel, insanity, if he attempted it? If he attempted to go too fast and in an aberrant direction, he probably would create havoc, but as for the physiological processes governing the brain mass not being able to arrange for the maintenance of an increase of volume and intensity of Volition, conformant to reality, we may trust nature to meet the emergency. And as for the aspiration to godliness of will, we have the invitation and example of Jesus of Nazareth to encourage us in that; nor was He a fool in respect to the wisdom of life and creation and in the mysteries of emotion. How can you who have become automatons in a material round, with shriveled centers for the perception of superior causal forces, presume to pronounce His philosophy false? Even among those who have striven hardest to do so for almost two thousand years, not one has come to a full comprehension of the words and deeds of Him whose mind was the freest of all the free; who willed the miracles; who by His will could set the mechanism of the bodies of others aright.

The motory responses which have been obtained by experimentalist in the motory nucleus of the area of volition are those of the hind limbs. But mayhap we are now prepared to speak for the entire posterior surface of the hemispheres, as well as for the transverse middle, or for the entire brain. In the first place, the cerebrum from fore to back presents in the order of its motory nuclei a reduplication, part for part, of the functions of the spinal tract, the back representing the lower end of the cord, the pelvic end resting in the occipital lobes, Fig. 11. The head is thus curved somewhat under the chest, the intruding parietal eye-center being undoubtedly determined by the former pineal eye. The organic areas are located back of and below those controlling external motion. Throughout there is a striking resemblance to the blastoderm.

The brainal nucleus, for motory nuclei within the respective larger areas, whose functions spread into the emotional, these motory centers but are, that regulates the extensory muscles of the lower limbs, enters with Approbativeness, sensorily and motorily. We saw how that area contains a wavering element. In its positive extreme it represents ardent interests rather than thorough practicality. The muscular control which enters into the erect and firm posture and gait, is still absent. A frivolous person and a vain one is inclined to walk on his toes; he may be exemplified by the negro in good clothes generally. In volition muscular contraction, prehension, enters to offset the extensors and into combination with them.

High, then, as volition ranks as an outgrowth of cerebral associations, being all-powerful when the sum of emotional energy inspired by the back of the cerebrum supports it, it receives, in addition to certain organic and cerebral sensory stimuli, a special sensory incitement from the thighs and probably from a part of the trunk, and thither a part of the resulting motory discharge returns to finally awaken the latent muscular energy. A low volitional area causes the child to fall easily, and conversely. Through a large area the legs become firm by the aid of the contractors, in a stand or advance. The legs furnish the braces for the rest of the body, coming to the aid of the hand as well as to the powers of mind through the sense organs. "To stand firm" symbolically is expressive of mental firmness. The posterior limbs have always acted as supports to the fore parts of the body. Even quadrupeds rise upon them in their most determined purposes. In hesitation or timidity the legs show it most conspicuously and first of all. The vertical thigh and the erect trunk are the most inspiring of attitudes; later the head comes to their aid. The rigid neck of firmness is not an accidental poise, and arises co-ordinately with or in advance of the limbs. Moreover, the leg, limited though as to variety of motion, is the most powerful limb of the human body, its severe use quickly proving a tax upon the breath for oxygen. Kicking conjoins itself with the excited state of the area.

The deficiency of the area of firmness is quickly perceived in the outline of the uncovered head. It is perceived upon the forehead, since the skin now lies firmer there than in approbativeness, nor are the brows so much elevated. In producing a relaxation of the apeneurosis over the region of volition, both bands, the posterior one being of most effect, of fibers of the occipito-frontal tend to *contract* upward and thus, when their contraction is strong, they compress both the lower emotional areas and those of the intellect, leaving the will, uninfluenced from those directions, the more froward and senseless. Since the area is covered by the parietal plates, we need not be surprised if we also find its reflection in the lower jaw and that with considerable emphasis in a downward and forward strain, more marked than in approbativeness, and produced, not by the masseter, but by the temporal muscle.

Intellect and other mental emotions and functions are capable of producing strong force of character, but the force of will in its fullness can be supplied from none but the area of volition, from whence comes promptness and resoluteness. Volition does not vacillate groundlessly, and the less, the more unreasonable it is. It puts the force of personality back of the idea. When its mark stays permanently upon the forehead, we need not look for a searching openness of mind. Its ideational elements are then fixed and its motory promptness then leaves no time for long play.

A statue of a slight but muscular male figure, a replica of which can be seen in many of our metropolitan art museums, by one of the pupils of Michael Angelo, and representing Jason with the Golden Fleece, aptly shows the triumphant prehensive emotion, volition. The peculiar cap Mercury wears in the representations made of him, by its compressed top, appropriately portrays him as a pliant and obedient servant. In the Minerva of Mueller we observe a good portrayal of volition in both head and expression of face. The Oedipus of Teschendorff exhibits a marked will, but the expression of the forehead presents a momentary mental counteractive.

A modification, or subsidence, in some form, of the emotion of firmness enters into shyness, bashfulness, shame, yet not completely controlling these attitudes. The crestfallen hang their heads and drop their jaws and their eyebrows. In none of these negative attitudes, when will alone is concerned, do the muscles lose their tonicity, and they seem to be made as much to aid the emotion in recovering itself, through a position promotive of a gravity reflux of blood into the area, as for other reasons. When outward interests are involved in these drooping phases, the head, of course, is inclined to fall forward diagonally. The cervical muscles in the character of extensors come into action in commanding, or in calling a halt. The painful states of the area give rise to volitional hatred. As in the case of approbation so also in volition, the very presence of the area and its indication by the cranial muscles is impressive and the lower will is impelled unconsciously to yield to the higher, provided no other dominant function of mind interferes, as surely as brute force yields to man. A powerful volition does its work telepathically, we might say; and it is again woman that possesses the most power in this province, moving mankind whither and into whatsoever direction she listeth, and if only toward herself and for her own gain, according as she is egoistic or altruistic.

The thumb has long been considered as indicative of strength of will. Descarte observed that it fell forward into the palm at death. It is inclined to do so in any physical or psychical debility. That the will enters and manifests itself in the thumb points to that emotion's penetration through the entire organism. It is but necessary to stretch to revive our energy in general. But nowhere except in the upper leg and central upper part of the trunk is the will the predominant motory factor; elsewhere its effects are concealed by other and more predominant motory discharges, into a union with which it enters *to work out its* ends. It reaches the thumb and hand by directing its current into the motory center for that organ and producing a discharge therein that moves outward. The relaxation of the extensors, that are already involved in the lower sentimental zones, in death is well represented in a small Greek statue of a dead Persian, a replica of which can be seen in the art museum of Chicago. In his Psychiatry, Meynert has attempted to show that the extensor movements are aggressive, and will is assuredly aggressive and recognizable in the extreme of muscular extension, but is at its greatest power when the contractors come into action.

Volition,
  Temporal; aponeurosis of the occipito-frontal.
  Aspiration, prehensive.
  Pleasure in psychic prehension—Volitional lethargy.
  Leg and middle trunk firmness; general innervation.

CHAPTER II.

INTUITION.

Upper extreme of the frontal lobes.

Intuition is situated in the anterior third of the horizontal didactic circle, at the top of the hemispheres and at the summit of the calculative ring. The function of the area differs from that of Reason in the same but in a superior manner that calculation does. When we consider to what a small point percepts are reduced by a process of inclusion at this level, how everything is subsumed under a few great ideas, we need not be astonished that the area of intuition is crowded into a short and narrow cortical cap. At the same time we can take note of our ignorance in this supreme intellectual capacity; we have hardly begun to exercise it, and to broaden it. Intuition constitutes the loftiest function of prehensive intellect. It looks upon relations directly. Except in the case of the loftiest geniuses, consciousness very rarely receives or listens for a message from it. Much of its product, also, is still in the probative, formative state and not yet trustworthy. Its grasp is not full enough.

Intuition it is that first calculatively, and, with the aid of the data reason furnishes, grasps the deepest facts and relations of reality. It moves nearer toward the sanctum of Divinity. And what a velvety throne the area occupies! Next to that of Divination! It is at this point that man for the first time begins to comprehend his own essence, a force of forces. He no longer appears to himself as an *isolated* somewhat having an isolated soul, parading as the paragon of enigmas up and down the universe; but instead he sees himself as an energy related to all that stands below or above him. Now for the first time he really begins to understand human nature and dimly to perceive that all the glory history tries to make out of the grewsome past is nothing but a semi-brute pomp; all rooted in the inclinations of the flesh. In the past, mostly so in civilization, he sought his welfare in attempting to acquire the superfluous material of riches; in trying to make himself comfortable and keep himself alive by the manipulation of inapposite externality, all of which goes a very small way in improving and developing his nature. In every case, accordingly, he has degenerated and been condemned by nature, as the graves of nations show. The ascetic does not stand alone as a murderer of body and soul. And what though each succeeding people, that deludedly continued the course of civilization, improved a little! Science blundered. Religion theorized itself into the belief that the laws of salvation were discoverable only through Divine information, as if there were a gap between earth and heaven and man, and the First Cause were not in all, through all and over all. Try it and you will see that the complete human brain is constituted to ascend the scale of ideas from the sensation and percept to the intuition. Through its psychic elusiveness, for automatonism is still out of question at this height, the upper nature and processes within our own minds escape us through our inattention; through the exercise of the inferior mental processes.

In our present regime, we reiterate, where the influence of Intuition is faint, save in a chosen few, man will sacrifice his body and mind—degenerate himself and believe that he is saving himself. In religion he empty-mindedly busies himself with formulas. He flounders in the chaos inferior reason makes because of incomplete data and association, and cannot help itself out of it. Intuition, by its illumination, first makes plain this erstwhile folly and reveals the brotherhood of man—does it all in axioms few and terse. It broadens sympathy in the direction of all things. It subsumes man and the world under its view. It gives the impulse for a radical change of institutions so as to make a little more possible for the race an uninterrupted evolutional approach toward its sublime destiny without falling into tragedy by the way.

With the enthronement of Intuition, "know thyself" at last is on the way to become a practical motto. Selfishness is doomed. Not only is man known, but it is also known what he ought to be. The way to prevent misery and wretchedness is seen to lie in the comprehension of the inexorable laws of the universe, upon the obedience to which human welfare and happiness depends. Alas, say what you will, we are naught but machines, but machines of such a character that ordinary sluggish forces do not entirely govern, and at a certain point, cannot destroy.

At the intuitional stage the products of psychic association have reached such a sublime degree that language no longer serves in its old significance and we must resort to symbolism. Its knowledge owes very little to preceding pedantry and scholasticism, to nothing that makes itself believe crude hypotheses and imaginations. It owes nothing to mistaken intolerant bigotry, or to the authority of the schools and universities. Intuition perfected the reflection of truth and reality. It has no need to defend itself by rampart and bulwarks. For its cultivation we must turn to Goethe, Kant, Hegel, Shakespeare, Emerson, Tolstoi, Luther, St. Augustine, St. Paul, Christ. To these life presents many open pages of its book. To them the farcial character of formalities is evident, while the Golden Rule is comprehended in the fullness of its meaning.

Need we designate an area of Suavity? Of Impersonation? We may, and include within it all that lies laterally exterior to Intuition, in psychical idealty. It is that range of intuition, in the wings of the area, at which complete intellectual understanding and sympathies go outside of the self, to others, creatures and all things. It is at that range when reason sees that by a hostile attitude to the not-self it is hostile to and harming the self. It sees that by tramping upon its fellows it is subverting the most powerful of its co-working energies. Strange as it may seem, there is such a thing as a social, racial mind and soul. Invisibly mind influences mind. Crowds and races move as in one mind. The weak and the strong render each other mutual support.

The Intuition we described in the previous paragraphs approaches the perfected faculty, but the area has many possible limitations and defects. It may pervertedly act only in respect to the self; as the area is limited so the function is limited. It may lead to that view of life which sees the end of the processes of creation in mankind as he is, admitting of no energy superior to him. The late Ingersoll held some such view. Humanitarianism is subject to this limitation; it lacks the divine insight and feeling. That spiritual arrogance, however, which spurns the material side of personality and existence is worse than the untilitarian, for the reason that the former disrupts the process of evolution, while the latter does not do so completely, thus retaining a saving straw.

Again, Intuition at its lowest phase is humane; but at its highest and posterior level, it is benevolent, the possession of useless private property appearing to it in its mock character. Benevolence sees that man lives for man —himself and others—and for the elevation of all things, because when they are elevated he is elevated. Nor is the giving of acquisitions the extent of benevolence, for when we shrink from aiding others psychically and spiritually, we shrink by that much in our personality and more. By contracting we do not expand; we hamper the physical and psychical processes every time. For that reason it is that the law of love is the first of laws. The law that gives men power, the law crying for a reshaping of human conduct, for its humility and subordination.

In part the intuitive area lies beneath the hair, unless that falls out, through the stretching of the scalp and consequent enfeeblement of the hair roots, when the area develops under pressure beyond the portion donated by inheritance. When the area is low or only developed toward the middle longitudinal line, we instinctively feel the presence of selfish hostility of character. This effect is augmented when the divinative area behind is similarly high, for the religious feeling and arrogance easily go hand in hand. An intuitive area which is rounded—not too high centrally—and broad at once makes us feel at ease and at peace, in that we recognize the presence of a broad insight and sympathy.

Intuitiveness is too far removed from the orbital ridge to favor the formation of wrinkles over it. Moreover, since it rests beneath the arch of the forehead, the skin thereon necessarily lies smooth, modified by more or less tautness. Nor is there much play of the occipito-frontal muscle. The relaxation of the anterior fibres favor its excitation, as also does the upward contraction of the independent fibres above the nose and eyebrows, the point of greatest relaxation of the apeneurosis occurring over the area. A number of combinations are here possible. In an arrogant intuition the occiput is influenced compressively. The former contractions would tend to open the eyelids and brows as for observation; but the eyes themselves, with dilated pupils, look dreamy and see but inwardly; besides the eyeballs are somewhat turned upward; and man has in all time looked upward for the superior forces. He has enthroned his gods on high and the demons, in the depths. This upturned eye is the clairvoyant eye; it is that of ecstatic hypnotics; it is the intuitional eye, and more—but in momentary indulgences and efforts transcending externality we need not look for sound results. The higher psychic phenomena, whether dealing with reality or idealities, do not manifest themselves without the intuitive position of the eye. It is the benevolent humanly reverent eye.

In relation to Intuition in practice, it must be said that the absence, size and state of the superior occipital region has much to do in tempering it, in giving it warmth or permitting it to express itself in a cold brilliance, sublimity and beauty; in an abstract spirituality, ideality, or impersonality.

Intuition,
    Temporal; occipito-frontal.
    Higher abstract grasp.
    Pleasure in subconscious prehensions—Lack of intuition.
    Sympathetic expressions and momevents.

CHAPTER III.

DIVINATION.

Upper end of ascending frontal lobe, including parts of what is usually considered the second and third frontal lobes.

If Intuition were not emotionless, in that it is unaffected by organic states per se, it might be considered as the summital area of the brain, but since it lacks the personal element of emotion almost entirely and has no direct external motory outlet for deeds, we can place it no higher, as regards personality, than at the summit of intellect. The crowning cerebral area is situated at the upper extreme of the constructive zone. We shall call it Divination instead of "Veneration," and in treating of it confound some of the cherished opinions generally held in regard to its function and in respect to religion.

In the first place, Divination, being situated at the cerebral vortex, the confluent point of the intellectual, emotional and motory regions of the brain,—lodges delicately couched in the upper extreme of constructiveness, and is tinged by the temporal muscle. It lies under the central point of the elastic epicranial muscle. The area is, furthermore, excited and reinforced by currents coming directly from Intuition and imperious Volition, and the resulting vibration goes a degree above those of either of these areas. These influences make the area, spiritually constructive by position, semi-intellectual and semi-emotional. Since the fibres of its motory nucleus run almost immediately into the corpus striatum, its influence upon life has always been enormous.

The products of Divination elude the direct grasp of consciousness. To express them truthfully requires a greater symbolism than that of Intuition, yet, nevertheless, we attempt to crowd them into and attempt to understand them in the commonplace perceptive terms of life.

Divination deals with the immaterial, the ethereal, not to be understood in the forms of crude matter. It is in contact, through the aid of intuition and reason, with the unknown causes and the Unknown Cause; with those energies that stand above all others. We call its knowledge inspirational; and that knowledge cannot be grasped and interpreted except inspirationally, at our present stage of development. It works beneath consciousness, sub-consciously, its connection with the senses and perception unbroken—the ideal is ever founded upon a material basis.

In all time it has been natural for creatures and man to prostrate themselves before recognized superiority and omnipotence, illusively perceived as existing upward only. In its tenative stages Divination has not sought a First Cause, but it bowed down before a plurality of ruling causes of an unknown and mysterious order. The manner of proceeding, the manner of arriving at the truth in the way explained here does not alter the nature of inspiration, for if the First Cause works through everything, then the inspiration does ultimately come from Him by the route of the senses. It is necessary at this point to bear in mind that since mind is an energy, it is influenced by energy, and consequently is in contact with externality by subtler means than those of the sense-organs.

Emotional religion, however, is not trustworthy, for emotion may attach itself to an illusion most intensely and intolerantly, as emotional study and history confirms; and yet emotion welds the self to truth. Constructiveness, where excessively ideal, adds another untrustworthy factor to Divination. What idols, what gods, what theories of religion have active and practical men and races made for themselves; fetich, animal, man, God, have all been worshiped. Again, a purely intellectual religion would be the undoing of man in the flesh.

Divination lies in the egoistic zone, and no religion has ever appeared which was completely devoid of anthropomorphism or of emotional egotism. It is not so much a case of man in the image of God as of God in the image of man, either in the physical or psychical aspect of religions. This attitude is consequent upon the penetration of volition, the "I will" into the area. It is the easiest of steps for the imaginative enthusiastic devotee to declare himself God, and if not that, a messenger of God or one sanctified, therewithal that he is the same pigmy and ignoramus he was before he became agitated and mentally unbalanced. These illusions are further favored by the attempts which are made to understand the infinite in terms of the finite, taking these literally instead of suggestively and symbolically. There is an insight which cannot be put into words and kept. The less the height of the area of Divination is, the more concrete and simple are its inspirations; the lower are its gods. The narrower it is, the more bigoted is its anthropomorphism. The broader it is, the more it escapes egotism and the nearer it approaches the truth.

The revelation of the true causes and Cause will finally be the same the world over and will not be modified and distortedly understood in the forms of the imperfect, cruder self and of changing material environment. The unknown at the first glimpse always tends to inspire fear or a profound respect. A being either flies or prostrates himself before the shrouded powers superior to him that could crush him like a worm, making the matter worse for himself by ascribing human personality and its caprice to them. The humiliation he makes of himself, for purposes of conciliation, is only modified by the egotistic strain in his own nature. As the religious faculty broadens, it sees itself in the true relation to superior causes, with which it cannot deal as with earthly ones, and that these are not hostile to it, unless by its own conduct it breaks the causal harmony upon which its well-being and happiness depend. The superior energies and causes are our fate, but there is no fickleness, no artificiality in their working. Even the Divine mercy is dealt only to him who deserves it. Nor is Divination constantly reigning supreme in inferior stages of mind. At times it lies dormant and then inferior areas run riot. A horse thief may at the same time be possessed of a profound Divination, but if his cerebral organization is unbalanced to the extent that the supreme area, consciously or unconsciously, is not in control, he is not a rational or matured being; he lacks the volitional element; his actions are not adjusted in harmony with the universe, nor with himself. Religion as religion, an ethereal mental buoyant somewhat, as a speculation concerning a somewhat not connected with the earthly causal order, is false. It must be practical and permit of being put into practice. Its works must withstand all mundane storms. Neither pantheism nor a pure anthropomorphism furnishes a reliable foothold for the human mind and being. Without the recognition of divine personality in its own dignity, religion is mechanical and harsh. And, as to the trustworthiness of the inspiration of Divination, the remarks made in speaking of Intuition also apply here. In comparison with its reasoning inferior reason fails humiliatingly and occupies the position of a small included circle, therewithal that the latter is efficient in its own sphere, in the matter of details.

The external motory responses which have been obtained in this area seem difficult of explanation, and yet they are those which accompany worship and the awe in the presense of power the world over; namely, the hind limbs are flexed upon the trunk, or rather the upper trunk prostrates upon the collapsed legs, the head being necessarily carried with it. It is a negative rather than a positive action; the body collapses before its own creation, which may correspond with reality or not. But what may appear as a superior being or power today is not so tomorrow. So one illusion after another is unmasked in the course of the ages until man does really come in contact with a power superior to him, which he cannot equal in the flesh, and before which he may always appropriately humiliate himself; or stand with erect and extended trunk, for in part at least God is within him, without displaying the hopeless conceit of the Pharisee. The reason for there being a nucleus here for the upper trunk at all, is the immense importance the thoracic organs in their highest evolution are for mental illumination.

Divination lies beneath about the center of the apeneurosis of the occipito-frontal muscle. The activity of the area would require the relaxation of the muscular bands at both ends, but there are various possible modifications, the detection of which, as they occur upon the forehead, is not difficult. When Divination is at its best the eyebrows are moderately raised, the forehead serene and yet not joyously proud; it preserves a mean.

When Divination concerns itself with tangible material causes only, its interests, as the broad interests generally *are in Christianity*, are those attributed to the Devil, because they go astray from the core of the ego; the eyebrows are lifted toward the tails, in a line with the wings of the area. In this case there is a range of thought which yields freedom, and no inconsistency with the adjoining optimistic area, for that area but concerns itself with invisible forms that are closely allied to life and existence. The state of mind is fortified by the downward cast of the eyes. In the loftier insight the eyeballs turn upward; from above the evolving creatures have ever taken their inspiration. The down-turned eye bespeaks grovelling interests and small insight. The passing out of view upwardly of the pupil effectually shuts off all perception, permitting the mind the better to bring about the exalted association from the store-house it possesses; and the resultant feeling of ecstasy is by no means incompatible with the occasional prostrate attitude of body.

None of the heads of Christ thus far portrayed in art truthfully represent the divine head, high and narrow though some are, itself a fault; nor do they truthfully represent the expression of eyes and forehead even to the instinctive gaze. The Christ in the marriage of Cana by Veronese, upon the whole, is the most appealing. The Christ of Titian is one of will but of little inspirational insight. That of Hunt in the Light of the World, is a flat-headed worldling. That of Murrillo, an intelligent Jewish trader. That of Corregio, in Noli me Taugne, is light and foppish, though giving the impression of a passing embodied spirit. The appeal in physical ways and color these works make in pictures constitutes an entirely different and outside matter.

A lofty Divination is often observable in the Hindu priests, and they undoubtedly attain a high degree of insight, but since their acquirement is mostly reached in seclusion and separation from reality, it is likewise mingled with much of imagination and constitutes a sort of inspirational scholasticism. Their insight is not as trustworthy as that of Christ who, if he did fail to expound upon the material side of life, did so avowedly, leaving to Caesar the things that are Caesar's.

Divination,
  Temporal; apeneurosis of occipito-frontal.
  Spiritual aspiration.
  Pleasure in lofty psychic construction—Low materialism.
  Upper trunk movements.

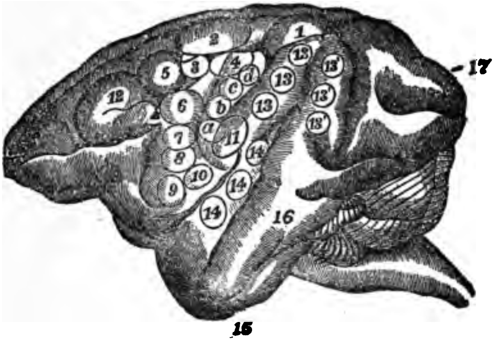

Fig. 11.

CORTICAL LOCALIZATION. (FERRIER, ETC.) MONKEY'S BRAIN UNDER ELECTRICAL STIMULATION.

Nucleus 1′. Movements of feet of hind limbs.
N. 1. Advance of hind limbs, as in walking.
N. 2. Complex movements of hind limbs and adapted movements of trunk; foot toward center line of trunk.
N. 3. Tail.
N. 4. Contractive movements of arms.
N. 5. Extensor movements of arms.
N. 6. Extensor movements of forearms.
N. a, b, c, d. Prehensive movements of hands.
N. 7. Retraction of zygomatic muscles.
N. 8. Elevation of wings of nose and angle of upper lip.
N. 9 and 10. Movements of mouth and tongue.
N. 11. Simple movements of mouth.
N. 12. Eyes open; pupils dilate.
N. 13. Eyes move; pupils contract; concomitant movements of head.
N. 14. Pricking of ears. Concomitant dilation of pupils of eyes and movements of head.
N. 15. Torsions of lips and nose of same side. The foregoing movements take place on opposite side of body, but those of the eyes are complex.
N. 16. Movements of parts of mouth; as if affected by a stimulus.
N. 17. Pelvic.

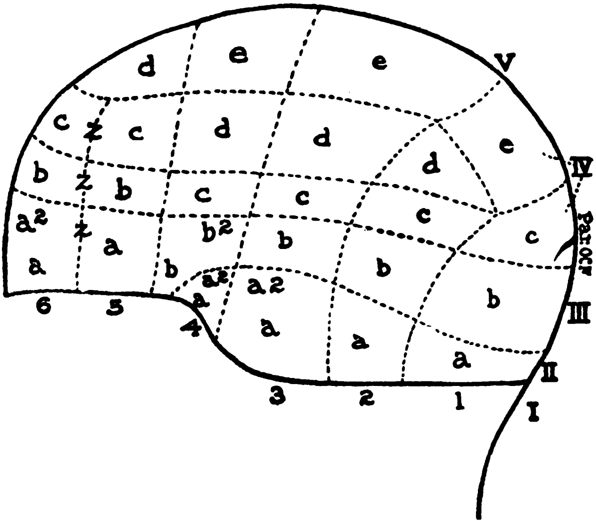

Fig. 12.

(TENTATIVE.)

HORIZONTAL ZONES.

Zones I to V are stages of the cerebro-spinal system approximately showing elaboration of predominant movements, molar and molecular.

I, Reflex (including brain axis and cerebellum). Vegetative.
II, Simple. Animality.
III, Complex. Individuality.
IV, Ideal. Personality.
V, Spiritual. Didactic.

See also Romanes' outline of the ascent of animal functions.

TRANSVERSE VERTICAL ZONES.

1. Social Zone.
    a. Carnality.
    b. Amativeness.
    c. Affectiveness.
2. Preservative Zone.
    a. Self-defensiveness.
    b. Courage.
    c. Cautiousness.
    d. Conscientiousness.
    e. Approbativeness.
3. Prehensive Zone. (Objective.)
    a. Destructiveness.
    a2. Vigilance.
    b. Prehensiveness.
    c. Sublimity.
    d. Veracity.
    e. Volition.
4. Constructive Zone.
    a. Taste.
    a2. Vigilance, constructive.
    b. Constructiveness. Oral.
    b2. Constructiveness. Manual.
    c. Ideality.
    d. Optimism.
    e. Divination.
5. Intellect, prephensive. (Subjective.
    a. Number.
    b. Calculation.
    c. Impersonation.
    d. Intuition.
6. Intellect, constructive.
    a. Perception.
    a2. Abception.
    b. Conception.
    c. Reason.
    z. Tune.

The psychological trend of the transverse zones.

1, Social.
2, Moral.
3 and 4, Industrial.
5 and 6, Intellectual.

CHAPTER II.

NEURAL DIFFERENTIATIONS.

As far as the immaculate nerve-cell is concerned, it appears to be sensitive and that is all. Its sensitiveness is amorphous. If it can be properly nourished its transposition to any part of the universe is possible; and if there were a cerebro-spinal system that system would construct a new psychic world for itself in attempting to gain for itself a true reflection of reality, but this reflection would differ completely from the earthly psychic manifestation.

For the nervous organism everything is true, no matter how the impressions originate. Rationality originates in repeated impressions. When it is in any way injured and the currents cross one another or form abnormal combinations, the resulting neural state or the state of mind appears as true to the subject as the common view of the world, provided there is likewise no pre-established rigid personality. But even normally no two persons view the world alike; two widely separated nations are apt to stand radically opposed to each other in their interpretation of it. We might say that it is only by the dint of sheer force that the child is brought to accept the average view. It sees nothing incongruous in its own chimerical versions, resulting from an unfixed neural system. A madman is sane, his insanity coming about through his severe conflict with reality.

The special impressions the various nerve-cells and centers take within an organism and their special modes of response, aside from histological factors, come about through their isolation with respect to impressions; each is impressed by its own special sense-organs peculiar in structure, or by other nerve particles. So it is likewise with the motory system. They also appear to possess a property, which is attributable to their constant underlying physical connections, of becoming inured to one manner of response and then being almost incapable of others, callous to other impressions. However, within the periphery of the cerebrum, some particles seem to maintain the original amorphous character, and a myriad of daily experiences, sensory and motory, pass through them without leaving a trace of memory; only by dint of earnest effort, by repetition, is a particle imbued with a special memory and brought into associative relation with other cells by means of the white nerve lines.

In the light of morphological investigations, this specialization is established through the stringing of the white nerve fibres from the gray cells to this or that part of the organism. Muscles and nerve matter are two extremes of the living cell that have never been cut off from each other despite their separation. The nerve lines pass unbroken from center to periphery, but with the muscles it is not so. These have been divided up into short strips, and the strip that mechanically affects the vertebra is generally not the one subject to special innervation; in the case of some of the cranial muscles there never existed a connection with the muscles of the limb or organism, except in the case of the temporal, that contracts concomitantly with them or subsequently to them. In the entire organism the later parts always presuppose others; the cortical areas, the subcortical. It is the primitive undifferentiated cell alone that must have been compelled to depend upon external molecular and molar influence. It possessed only a general memory of sensitiveness and no connecting fibres.

With the foregoing arrangement and interplay of muscle and nerve tissue, nothing can take place at haphazard. Each gray particle of the neural mass, by some white line, is definitely connected with some muscular fibre. Again, the gray particles have a certain connection among themselves. That, we have seen, varies extensively when we reach the cerebral mass and gives the mind its freedom of play without causing serious confusion. Nor does the Bible say aught against this process of man-building. What plan the Creator pursued is for us to find out, and no theory which does not harmonize with the facts will stand, any more than did the Greek or Teutonic mythologies.

With the appearance of the inflorescence we call the brain, built up out of the most infinitely fragile material, sensitive matter in almost its purity,—the interplay of reflexes within the cerebrum finally culminated in the phenomenon of consciousness. Moreover, the construction was at length adapted to invisible energies of environment, such as the sense-organs take no notice of directly. The mastodons were a failure, for they could not maintain a harmony with the subtler intangible forces. There came beings greater than they, one infinitely greater, possessing a nervous organization of such import that Plato, a philosopher, had good reason for declaring mind an independent entity.

In the entire nervous organism, cephalic and spinal, the openings left for quarrels are normally reduced to a minimum; there are few chances of nerve cell interference and non-performance of duty. The threads running to and from them are insulated; when their forces are unified, that occurs in special ganglions. With the wonderful intricate workmanship of the brain itself enshrouded in a palace of ivory, it is not strange that mankind has spun psychical myths long after physical myths were put to mockery. [5]Some repulsive experiments have been made to ascertain the fundamental facts which enable us to venture these crude explanations, but we must excuse them on account of the obtuseness of the human mind; in some manner it must learn, but by out and out speculation it never could. If we could play upon man or beast as we play upon a musical instrument, mayhap we could arrive at the truth more humanely, intuitively. But even these cruel experiments employ electricity, a far cruder force than mind energy is. Beyond a certain limit we might as well lay our clumsy fingers upon the keys of the brain as to apply the electric current.

There can be no doubt that the energy which enlivens my nervous system will also enliven another's as far as the structure of the two is similar, though it is a question whether at any moment it would regulate two systems perfectly. The possibility is testified to in muscle-reading, telepathy. The control takes place in hypnotism, when it is always more or less of a strain upon the operator. Our very speech in some subtle way conveys far more meaning than the words do. It is because of our constitutional differences that the process is more or less difficult; it is further impeded by our apathy and ignorance of procedure. If we were ancestor worshipping automatons, alike in looks and thoughts, the matter would be easier—ants communicate by mere touch—but then we would simply be the noblest animal on earth and nothing more; our skulls would become liable to be marked by bony crests and muscular thicknesses.

But as for reading the mind from the conformation of the skull, that can be done in the most general way only. From the skull we can discover no more than the brain's potentialities; for the areas that are active at any instant we must look to the cranial muscles in the manner indicated in this volume. To suppose that we can determine the particular phases and memories of mind from the exterior covering of an area, is folly; for the brain particles are infinitesimally small, it requiring a considerable number of them to perceptibly add to the volume of an area. The difficulty is greatest with intellect and least in the case of the emotions. Moreover, when all is said, it is always essential to know a subject's environment and past experience, his idiosyncratic power of association, in order to definitely interpret his mind at any moment. Yet while we do not know all, it is employing our minds tentatively with what we do know that we can hope to learn more, and to evolve. There is no break in the chain of causes and no break in the evolution of the brain and its phenomena. It devolves upon us to unravel the origin of the brain in the light of evolution, if we desire to remain consistent. And in our investigations of what directly concerns man, we are engaged at once in the most utilitarian and noblest of works. The task will guide us toward the personality of the Creator, whom yet no mind shall see and maintain its earthly connections and earthly mode of existence.

CHAPTER III.

NEURAL CONDITIONS.

Whatever the structure of the nervous system is; whatever may be the factors which enter into its operation, cranial muscles included, it always presupposes a histologically and physiologically perfect organism, possessing a proper reserve supply of nourishment to serve for the liberation of energy. Likewise there must be a vaso-motor control efficient enough to call up the reserve. When the body is anemic the brain areas first in order, in the chronological and embryological development, those essential for physical preservation, alone act, since they are stimulated by overwhelming sensory impressions arising from the tissue of the organism. Starvation will bring a human being to the point of remorseless cannibalism because all his better knowledge has left him. The higher areas become lethargetic, although they may still continue to produce faint and intermittent responses, but responses that are of no strength, and possess no self-sustaining power. A vivid response from them at any time depends largely upon favorable conditions, upon desire and a waiting patience. But in the case of anemias the responses from the inferior centers are also fitful, tending to disappear, and yet the areas may even then be aroused to pitches of terrible force. A peculiar fact is that noted in the intellectual activity of the narrow forehead which appears to be incapable of any intensity, either receptionally or expressively, except under a high blood pressure, excitement, a state with which the voice is raised concomitantly.

By the broad head the same work is done calmly. Shallowness and depth are subject to similar preconditions.

Neither is our mental capacity normally the same from moment to moment, hour to hour and from day to day; in these intervals most of us undergo complete changes of personality, the lower state knowing little or absolutely nothing of the higher. On one day we grasp an idea of deep meaning and behold it in its broadest applications, all is brilliantly clear, mayhap we make an extended note of it in writing; yet on the following day we see nothing but a string of words interspersed with whimsical scraps of memory. A poet can often not interpret his own poems subsequently to the inspiration—not strange then is it if they are not appreciated by others. Philosophers in their old age have been unable to recognize their own works. Considering all this, is it remarkable that it often requires centuries for a genius to find an interpreter? centuries for permanent improvements to take place in mind and body?

These ebbs and flows of mind sometimes depend upon illness, or again upon the quality of food eaten. Proteids and gelatins have much to do with making deep, connected and sustained thought possible, especially when they are reduced to states from which they are readily assimilated. Temperature also is either favorable or unfavorable; thus we read that the author monks of the tenth century laid their pens aside at the approach of winter. An accessory breathing is likewise necessary for a high cerebral energy.

Fevers, stimulants and extraordinary effort may bring about conditions when, despite the fact that the body is on the point of collapse, a draft upon the last physical reserve makes the highest mental activity in the areas lying above the direct influence of the lower cranial muscles, possible for a considerable length of time. Writers, orators and many ordinary folk resort to intoxicants to bring about this morbid and unnatural capacity, though these still possess the ability to divert the currents upward. Some accomplish the end by social intercourse and by other questionable methods. The resulting mental fruits are often deceptively wonderful, but they will not bear close scrutiny. They are apt to be full of sophistries, for beneath this pressure the mind reacts upon the matter first present, upon matter which is not a part of personality, and which is not beheld as a part of the system of truth. Such a state of mind, furthermore, jumps to some conclusion and then is cunning enough to proceed with considerable consistency in treating of it, in choosing its arguments and illustrations. Nor does it generally openly offend morals and ethics, but between the lines it does, and a pernicious effect is inevitably, oft diabolically, wrought upon the unsuspicious audience, an effect unconsciously wrought as it is concealedly impressed.

CHAPTER IV.

INTERPLAY OF NEURAL ENERGY.

We have previously discussed the interference neighboring cortical areas may exert upon one another, and we have referred to the influence they exercise upon one another through connecting fibres that extend from lobule to lobule, from convolution to convolution and from region to region of the cerebrum. We shall now consider these connecting fibres directly, and in doing so our introspective knowledge or, rather, our analysis thereof, in combination with the laws of nature, will assist us in the absence of artificial experimental data.

If it were not for the existence of these associative fibres, although the cortical mantle were present, the phenomenon of mind were still impossible. They determine the direction the transmitted currents are to take, though, strictly speaking, there is no passage of a current any more than in the case of electricity. If there is a stimulation at one end of a line in one area that stimulation arouses the energy within the area of the opposite end, with accompanying metabolic processes. These fibres, as long as the parts of the brain concerned are employed or are not paralyzed, in conjunction with their governing end-cells, act automatically, i. e., when they are once formed, otherwise the results are none or vague. Thus one memory calls up another. But the currents can also be forced, and this forcing is aided by the intensity of the stimulus and of the action of the initiative area. Into what locality the cerebral current shall go within the cranium is, primarily, determined by the tension of the cranial muscles overlying the receiving centers.

Antecedently the currents pass inductively through the cell matrix from brain particle to particle, accompanied, undoubtedly, by the attraction of cell tails or by the formation of these. These tails lengthen as the cells recede from each other and may even, eventually, temporarily or permanently, join two or more cells in the form of white fibres. We need not here go into the details concerning the formation of new cells. The long, intracerebral, efferent, motory fibres, such as extend from the back to the fore part of the brain, must have been the first formed, out of or in connection with the axis cylinder lengthening as the sections of the original vesicles separated.

When the paths of communication have once been established and are inheritable, through experience, education or habitual use, it comes about that each individual is saved that much preliminary nervous effort. True, in the child the fibres may not be complete and are easily subject to degeneration, but they are also easily matured, for they are sufficient for the first ambiguous guidance of the currents. If the child is more or less an animal in its ways, it is so because, in order to set the currents right and perfect the lines, it must go through these antics imitating the original mode in which the brain was evolved, formed and set into operation.

These connections do not prevent the various areas from preserving their individuality, or from developing new and supplementary connections. Hyperemias often sever the connections; while anemia of the brain weakens them, making the mental process faint, often making it impossible to render an impression clear and to bring a thought *or state* of mind into the grasp of consciousness. The same vagueness of mind and impossibility to attain results is experienced when the communication still occurs inductively, as we noted in the case of the infant. There is then a wavering and uncertainty of mind which is absent when the avenues of communication have become fixed and when we can often correctly predict a well-known person's thoughts, emotions and actions, if we possess the clew of the stimulating environment, whatever that may consist in.

Rightly enough the question arises as to whether the cerebral currents pass back and forth over the same lines. It is not likely that they do, except in the slightest degree. Afferent and efferent currents hold each their special paths, either having few recurrent fibres mixed with them. The efferent state of a cell undoubtedly makes itself manifest, propels itself as a unity, from a single point and that is the axis cylinder. It is the more or less numerous dendrons surrounding a cell which constitute the receiving points; these stand in communication with incoming sensory currents directly, currents arriving from the opposite hemisphere, from the neighboring and distant cortical cells and from sources outside of the cerebrum. If then a cell stands for an idea, that idea will be complicate and full in proportion to the number of appropriate afferent currents the cell receives; it will be abstract in proportion to the distance the confluent cell is removed from the basal cells which receive the sensory impressions; it will be clear and vivid in proportion to the completeness and force of the afferent currents striking it.

CHAPTER V.

CELLS AS SENSORY, EMOTIONAL AND MOTORY.

If one does not understand the nomenclature employed concerning the brain in its restricted sense, he is apt to fall into the error of supposing that not all of the cortical mantle is motory in its function; yet no vibrant, nervous or brain cell is other than motory. In like manner it is in some degree emotional. The motory areas proper induce physical movement directly through a transmission of a current into muscular tissue; at the same time they are sensory, and in suspense they are emotional.

When the nerve cells send their message from cell to cell, from lobule to lobule, from convolution to convolution, from hemisphere to hemisphere—they relieve themselves of the emotional tension and act motorily, no less than when they send it to the spinal centers or to the fingers' ends; but many persons—Hamlets—indulge only in a seething emotion or headwork, standing aloof from physical action.

CHAPTER VI.

BRAIN PRESSURES.

The activity of this or that part of the cortex depends upon a delicate and rapid vaso-motor response, regulated chiefly by arrival of nerve-currents from the periphery of the body, but also by the passage of the currents over the fibres joining the various centers. Yet, owing to the part the cranial muscles played in determining the location of the different centers, especially those of the base of the brain, these muscles cause and even start a vaso-motor activity augmentatively to and independently of the nerve currents. Pressure upon the cortex, of course, interferes with or checks this activity, and to that cranial muscular impression is in a measure equivalent. Among the various causes of pressure are the hardened skull, tumors, inflammations, crowding of an overstimulated or overgrown area upon an adjacent one, jarrings. The fine capillaries which dip down from the pia mater are easily choked, and brain paralysis is tantamount to organic paralysis in so far as the organic parts are dependent on the brain.

Despite the fact that the brain is enclosed in a tough covering, this covering is not rigid and permits a certain amount of pressure of one region of the brain upon another; of the lifting of the cortex with increase of blood pressure; of the cranial bones upon the cortex, under certain conditions. It is these mechanical pressures and their effects that we shall discuss in this chapter. This pressure varies with the posture of the head and with the formation of the evaginations of the cortex. The carriage of the head, therefore, must have been a factor in determining the location and direction of the principal fissures and sulci; though the direction of some of the most prominent upper evaginations was largely dependent upon the cranial muscles. Their relation to the cranial muscles is constant but it is not so toward the sutures. A subsequent change in the carriage of the head also somewhat affected the direction of the fissures. It is at once evident that the later areas easily act repressively upon the earlier ones above which they are superimposed, in spite of the action of gravity upon the blood and in spite of the precautions present in the supporting membranes and the ridges upon the inner face of the vitreous plate, and of the lymph pockets toward the base. In the case of the individual lobes and lobules, however, the basilar and latest additions are the ones subject to pressure. And since man is inclined to throw the head slightly backward, he gives the frontal region a superior advantage. The carriage of the head thus introduces a muscular influence and language of a secondary character, to be observed in the muscles that move it about, in addition to their areal effects.

The human foetus lies inverted in the womb, a position favoring the vital areas at the base of the brain; the blood drawn to the upper brain by gravity dulling it further and expending itself in growth. The olfactory area lies back of the lesser wing of the sphenoid, and man, besides other creatures in whom the area is added to the olfactory lobe proper, is inclined to tip the head up and backward in smelling critically. The area of Taste is affected in the same manner. Tipping the head forward impedes the activity of these centers. A blow upon the back or front part of the head tends to choke them up by a concussion against the bank of the sphenoidal bone;

such blows may clog up these areas permanently. Some areas are clogged up more easily than others.

An angry person is inclined to throw the head forward, animal fashion, naively thrusting it into the face of the offender; an act which at once dulls the intellect and permits an increase of circulation in the temporal convolutions, the occipital region when present, being affected for action, or is even counteractive. In this attitude the area of speech is also compressively impeded, an effect increased by the manner in which the temporal muscle is employed, and man becomes indeed a senseless brute in anger, even stuttering in speech.

A peculiar organic stimulation is produced when one, in lying down upon the sides or back, experiences a feeling of chilliness, and turning over upon the stomach, warms up. The ventral position is one favorable for sleep also, for when the forehead is turned downward, though but diagonally, dreams of a conscious character are reduced to a minimum—the intellectual area, for which sleep is the most essential, is at complete rest. If then there occur dreams they are of an emotional, erotic or reflex nature, causing little annoyance to the nervous system. The lower brain mass, and organism, needs less sleep than the forelobes. Contrarily, lying upon the back lowers vitality and favors intellectual dreams, unless the head is very much bent backward or forward in this position. The partial repression of the motory areas, making one helpless, is apt to make these dreams horrible, painful sensory currents from the viscera adding to the horror. Undoubtedly the descending aorta is compressed in the position upon the back and freed when the body is turned upon the stomach, the ascending aorta being affected vice versa, and yet it must be admitted that in the position upon the stomach the subclavian branch of the ascending aorta, the branch running to the occiput, is left the freer to produce occipital activity, aiding, cerebrally and emotionally, the physical stimulation caused by the uncompressed descending aorta, lying close to the vertebral column.

The open mouth, if there is any tension upon the masticatory muscles, has a corresponding effect upon dreams; and so it is with tensions upon various other cranial muscles. The activity of an area in dreaming may be so intense and prolonged as to cause congestion, lesion and insanity. In somnambulism the motory centers predominate, and there is no consciousness. But in these intense dreams it is often the case that the congested center of a waking state begins its turmoil in sleep, and will not brook any counteractive interference from compressions, though muscular tensions, especially of growing muscles in the young, and freedom from compressions can still further intensify them.

The musical area, that of Language, Constructiveness, and all that are situated laterally, if there is right-sidedness or left-sidedness, are all favorably or adversely affected, according to the position of the head; the two sides, according to observers, also affecting the memories in respect to the period of life in which they were acquired. A head hanging forward cannot be said to indicate depth and alertness of thought, except under strong excitement, under arterial pressure which hurries forward the blood, and overcomes all obstacles and even gives power to a small brain. Generally the hanging head portrays intellectual dullness; its thought is forced; it betrays emotionality. In the adult the upper intellectual layers compress the lower, and the very position of the head causes a wedge of bone to form and permanently tip the forehead *upward* (Cleland).

After omitting much that might still be brought forward to illustrate the principle promulgated, we must yet call attention to the side-lying posture. The question must have arisen in many a mind why the side we lie upon does not fall "asleep" and is in no way benumbed. The mystery is solved when we take note that the innervating cerebral side for the under side of the body is the one uppermost, thus producing the corrective influence.

Coming under the head of the internal cerebral pressure are those cases of persons well informed and adept in some one subject—crankiness in inferior minds, "genius" in the higher; when there results an incapability of turning thought and attention to certain other subjects. In part this monomania may be due to a loss of vasomotor control in the neglected and inert areas, but we must likewise take into account the hardened skull resisting the expansion of the abnormally active areas, for several areas must act in conjunction. The enlarged areas, consequently, press upon the adjacent ones; and, no doubt, they likewise cause modifications—if they were not themselves caused by these—of the cranial muscles; for the muscles present many variations in different persons, and their cerebral effects must differ accordingly.

While pressure upon adjacent non-resistant areas cause partial idiocies, the case is often more serious when the pressure falls upon a center or point important to health and life; if, for instance, it falls upon the optic thalmus, the corpus striatum, the cerebellum, or upon any part of the enlargement of the spinal cord lying within the cranium and beneath the hemispheres, where much is confined in a very small space.

CHAPTER VII.

BRAIN DIMENSIONS.

Can a broad head be substituted for a high one, a short brain for a long one, and conversely? No, except to a very restricted extent and in creatures of the animal scale differing considerably in the structure of the head; in the mode of attachment of the cranial muscles. Principally not, because of the inherited nature of the long established areas and their connected structures. Secondly not, because of the persisting influence of the cranial muscles. A cerebral area can not reliably respond to a double musculature standing in such contrast as the lateral and dorsal muscles do, and that not in spite of the sensory connections. Yet some transposition of functions does take place, mostly in the upper brain, in cerebral pressure and encroachments, and on account of variations in the muscular structure in different genera and species.

When short-headedness forces longitudinal convolutions to develop vertical and transverse limbs, these limbs do not signify that the direction of an area has been altered, that it has been moved about. The very fact that in a brachycephalous brain the lateral surface exhibits an increase of sulci shows that the areas make up in depth for what they lack in length, and yet this increase often seems one rather of quantity than of quality. In a short head bones and muscles are also shortened. In the dolichocephalic brain the increase of fissures appears in the zones compressed in that case. The minds represented by two such heads are *as unlike* as the two brains.

The differences between a broad and a long brain are radical, when the two dimensions do not coexist. The former is pragmatic; its selfishness existing in this disposition. The latter is narrow, having great depth of intellect and emotion, or one of these only, and in proportion to its height.

The high brain is loftily psychical. The short brain is apt to lack intellectual, emotional and spiritual depth, and is liable to bigotry, a bigotry, though of a different sort, also appearing in respect to action when the brain is narrow. If intellect dominates brute force, then the long head is likely to make a slave of the unmitigatingly short one. The broad head in power inclines toward tyranny. If in any part of the organism there is a necessity for a delicacy, consistency and constancy of structure and adjustment, it is in the head and brain; the body, though necessary, plays a far smaller role than these two.

CHAPTER VIII.

TEMPERAMENT.

Temperament is a peculiar personal state and attitude determined by the composition of one's organism. It constitutes an enveloping somewhat, dependent on various degrees of callousness and sensitiveness of the organism, giving a ruling color to the psychic self and to mind, even to intellect. It is inherited in so far as we are shaped out of the ancestral germ-plasm and ancestral form, and acquired in so far as we are accidentally shaped by our own particular round of life. It is the latter phase only that will permit of any serious and easy changes in the course of a life-time.

Temperament is a persistent energy and consequent feeling which penetrates all the faculties of mind, all the nervous expression, repressively or intensifyingly. We can never know its exact limitations with a certitude. It arises out of the musculature of the organism, out of the bones, out of the fluids, out of the neural matter—out of one of these predominantly or out of several in combination. It governs man reflexively and, to an extent, against his better knowledge and will. It manifests itself because he is built as he is. Nor is temperament peculiar to man alone. To an acute observer, two fledglings in a nest instantaneously manifest a difference of temperament. Nevertheless the temperamental differences tend to disappear with the approach of life to simplicity and to the ground, to nature.

Men long ago attempted to make divisions of temperament. Unwittingly each one of us does the same thing for himself; empirically we recognize also the fatal thread it weaves into each life. The best scientific classifications which have been made are those taking the primitive germ-layers of the body, so well described by Hertwig, as their basis. Still the influence of any one of the organs or parts developed out of these layers may again cause radical modifications of temperament, often to the extent that it appears as if all depended upon the lungs, heart, liver or brain, mayhap on the bones; whilst there are likewise different degrees of relaxation and tonicity. Thus temperament has its undertones and overtones, without which man would become like a sounding brass. He cannot permit these tones to run riot. It is by striving for and attaining an internal organic harmony in comporting himself with the laws of truth that he approaches the beautiful, the perfect; a balance. By that he brings about an ecstasy, of cerebral origin, within himself forcible enough to overcome, in a large measure, the inborn animalism and material weight in order to realize higher ideals.

CHAPTER IX.

EVOLUTION.

It is to be feared that because of a still existent misapprehension of evolution, our work would be incomplete without a chapter touching upon some rudiments of that subject, still far from forming part of the general education and consciousness. Ultimately all organic variations, and I think Weismann himself does not contradict that, are derived from environment—not, in any case, from environment in its entirety, but from that portion of it to which the species and individual selectively—perhaps involuntarily—constantly and intermittently respond. Among these factors are some of which we possess no knowledge. Of all the animals man alone has maintained a pliability and intelligence sufficient to adapt himself to the mutations of nature through the ages and of place upon the face of the earth, delicately and complicately constructed as he is. When he finds it impossible to adapt himself to a certain phase of environment, he adapts environment to himself; in a measure he carries his accustomed environment with him.

Evolution is still in progress, though indeed not with its primitive varied and universal dynamic force as respects lower vitality. Outside of man, of the highly organized protoplasmic forms, a new fauna is not possible except perhaps through a cataclysm resembling those of old, that only some pulpy forms of the sea would escape. It will not be surprising if some day it is discovered that man, even in his savage prehistoric stages, witnessed more than one complete change of the higher life about him; in one aspect he viewed all of them. He alone has pursued the evenness of his way, by his superior pliability, cunning or wisdom, as you like, and escaped the millstones of nature in ages of water, ice or fire. Jehovah was the God of whomsoever obeyed the universal laws. To fix hereditarily an organic factor requires thousands of years. As long as such a factor is not fixed, there is an easy reversion to a lower type or to a higher, in contrast to its stubbornness when it has become fixed. The point is to acquire the proper fixtures and yet remain pliable.

Man has not always been what he is, at present, and even at present he exists exhibiting such radical differences in structure as to lead anthropologists to quarrel in regard to his origin from a single pair. He is still advancing though individuals and races, many of them that consider themselves right, are falling by the way. Some races can wander over the face of the earth almost with impunity; others hardly dare venture from their respective zones and localities. But there is no reason for maintaining that the different branches of the human kind originated upon different points of the earth; nor, again, for asserting that they sprang from a single pair. It is more reasonable and in accordance with events to suppose that they evolved from an originally aggregate of some species which adapted itself in the human direction to a phase of nature in some particular locality. On one side this gregarious body adapted itself to the prevailing external conditions and upon the other to social influence—it advanced with a common impulse toward its future mark, ever maintaining a certain toleration of change beneath its fixedness of purpose. The body gradually spread outward, forming new and more distant colonies. The separated colonies became estranged, though never losing their basal common heritage, a heritage which partly predetermined their future development—and never to such an extent that they would not recognize one another physically. They intermarried, by force or otherwise, and commingled their acquired differences in their offspring. Often the superior colonies destroyed the inferior, those that lagged too far behind. It was this intercourse that constantly counteracted the animal tendency of moving in a rut, and prevented the existence of higher apes than there are now.

The principal center of turmoil, in later ages at least, was about the junction point of the three old-world continents. Those colonies which receded toward the far extremes of these continents and those who penetrated into the western hemisphere, mayhap with a conservative spirit of recluseness, are the ones who remained nearest their animal forebears. Nevertheless these widely separated branches exhibit a potentiality for unification, the lower with the upper; because up to a certain point they inherit a common ancestral core. And this capacity does not lie so much in the nature of the relation of the muscle and nerve cells in themselves biologically as it does in the likeness of muscular structure, above all, that of the cranium, and the existence of a strong nucleus of the central nervous system; though for the cranial muscles and lower centers we are compelled again to make the same presuppositions until we arrive at the cell. If the lower races will but imitate the higher in the expressional movements of the cranium,—the cerebral sensory stimulation will take effect so much the more rapidly and evolution moves forward with a bound in the tried path laid out for it. And yet it is presumptuous to suppose that the existing vanguard follows upon the best path any people has ever started upon, or that it is possible to follow.

As for the ape or any of the monkey kind, it is doubtful whether they are capable of advance. They have become inured to a tropical clime, and have been permanently stunted by tropical abundance; an iron-clad bond exists between them and their territory. We need never fear their ascent into humanity; never will they break the shell in which they have allowed themselves to become encased; unless man undertook to educate their young, a stage of humanitarianism which will probably not be attained before the monkey tribe is extinct. The imitative power the monkey displays is in terms of what he is already capable of; and hence it produces no cerebral effect, and could not within a skull manifesting an early and extraordinary tendency to harden, much less physical structures.

To speak of man as ascending from the ape is nonsense, but the two may have sprung from the same living trunk as two branches. The offspring of one, free though it had hitherto been, somewhere in seclusion, became set in its ways, structure, and managed to escape destruction through the contempt in which the other finally held it. The offspring from the other played and sported with its potentialities, and play led to serious things. The latter must also have paid an unusual attention to the rearing of its young, to early draw out super-instinctive intelligence —the basis of civilization to-day is the education of the youth, mistaken as that education often is. To this education is added a breadth of human sympathy, acquired by the study of literature and history, travel and nature.

APPENDIX.

P. 55.

1. Sound cheers the area of vigilance in the same manner that sight cheers the area of caution, or as the sensory stimulus cheers in any case.

P. 101.

2. The sexual consummation is an excretory act, taking place through excretory organs.

P. 112.

3. The occipital brain also enlarges concomitantly with the use of the hind limbs in the upright posture. It is also true that the neural stuff found the most favorable retreat in the dorsal canal in the horizontal posture.

P. 173.

4. All the organic works of evolution were the result of uncritical inspirational efforts, for which environment served as a corrective.

P. 212.

5. Sacrifice has always been considered as more or less praiseworthy; and it is certainly better that one creature or being should suffer than that all continue in misery owing to mistakes made on account of ignorance.

P. 128.

6. That cleanliness is next to godliness, is not a vain boast. Dirt interposes a callous layer between nerve-ends and their enveloping tissue.

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